REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	28.Jul.99	DISSERTATION

4. TITLE AND SUBTITLE
LONGITUDINAL STUDY OF THE SOCIAL NETWORK INFLUENCES ON THE LEADERSHIP AND PROFESSIONAL MILITARY DEVELOPMENT OF CADETS AT THE U.S. AIR FORCE ACADEMY

5. FUNDING NUMBERS

6. AUTHOR(S)
MAJ PACKARD GARY A JR

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
MICHIGAN STATE UNIVERSITY

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
THE DEPARTMENT OF THE AIR FORCE
AFIT/CIA, BLDG 125
2950 P STREET
WPAFB OH 45433

10. SPONSORING/MONITORING AGENCY REPORT NUMBER
FY99-191

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION AVAILABILITY STATEMENT
Unlimited distribution
In Accordance With AFI 35-205/AFIT Sup 1

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited

14. SUBJECT TERMS	15. NUMBER OF PAGES	16. PRICE CODE
	191	

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

LONGITUDINAL STUDY OF THE SOCIAL NETWORK INFLUENCES ON THE LEADERSHIP AND PROFESSIONAL MILITARY DEVELOPMENT OF CADETS AT THE U.S. AIR FORCE ACADEMY

by

Gary A. Packard, Jr.
Lieutenant Colonel
United States Air Force

The University of North Carolina at Chapel Hill
Doctor of Philosophy
Department of Psychology (Developmental Psychology)

1999

(191 pages)

ABSTRACT

GARY A. PACKARD, JR.: Longitudinal Study of the Social Network Influences on the Leadership and Professional Military Development of Cadets at The U.S. Air Force Academy

This study investigated the influence of social networks on the leadership and professional military development of cadets at the United States Air Force Academy. Using a longitudinal design over an academic year (August 1997 to May 1998), the study examined the differences in the composition of cadet social groups and their influence on leadership development in two cadet squadrons. Cadet peer groups, identified using Social Cognitive Map procedures (Cairns, Gariépy, & Kinderman, 1990), were influential and stable components of the cadet squadron social ecology. Cadets nominated as "being a good leader" by their peers were not necessarily the same cadets holding positions of formal leadership. These "informal leaders" performed better on academic and military performance measures than other cadets in the squadron, were more respected than other cadets in the squadron, and were more central in the squadron social network. An exploratory measurement model of leadership suggested that leadership is best measured by both the formal position one holds, as well as, ratings of leadership effectiveness and respect obtained from other cadets in the squadron. Cadets who had high ratings of hostile aggression were less likely to receive peer nominations for being one of the "most respected cadets" in the squadron and less likely to be considered a leader in the squadron. These findings suggest that cadet social groups provide a rich context for leadership training and have the potential to influence leadership development trajectories. Suggestions are provided to aid in applying these findings.

References

Arbuckle, J. L. (1997). AMOS Demo (Version 3.6) [Computer software]. SmallWaters Corporation: Chicago.

Bass, B. M. (1990). Bass & Stogdill's handbook of leadership: Theory, research, and managerial applications (3rd ed.). New York: Free Press.

Bergman, L. R., & El-Khouri, B. M. (1998). SLIEPNER. A statistical package for pattern-oriented analysis. (Version 2.0) [Computer Software]. Stockholm: Department of Psychology, Stockholm University, Sweden.

Bost K. K., Cielinski, K. L., Newell, W. H., Vaughn, B. E., (1994). Social networks of children attending Head Start from the perspective of the child. Early Childhood Research Quarterly, 9, 441-462.

Browne, M. W. (1984). Asymptotically distribution-free methods for the analysis of covariance structures. British Journal of Mathematical and Statistical Psychology, 37, 62-83.

Burns, J. M. (1978). Leadership. New York: Harper & Row.

Cairns, R. B. (1999). The natural history and developmental functions of aggression. Manuscript in preparation.

Cairns, R. B. & Cairns, B. D. (1994). Lifelines and risks: Pathways of youth in our time. New York: Harvester Wheatshaft.

Cairns, R. B., Cairns, B. D., Neckerman, H. J., Gest, S., & Gariépy, J.-L. (1988). Social networks and aggressive behavior: Peer support or peer rejection? Developmental Psychology, 24, 815-823.

Cairns, R. B., Gariépy, J-L, & Kinderman, T. (1990). Identifying social clusters in natural settings. Unpublished manuscript. University of North Carolina at Chapel Hill, Chapel Hill, NC.

Cairns, R. B., Leung, M-C., Buchanan, L., & Cairns, B. D. (1995). Friendships and social networks in childhood and adolescence: Fluidity, reliability, and interrelations. Child Development, 66, 1330-1345.

Cairns, R. B., Leung, M-C., Gest, S. D. & Cairns, B. D. (1995). A brief method for assessing social development: Structure, reliability, stability, and developmental validity of the interpersonal competence scale. Behavioral Research and Therapy, 33, 725-736.

Cairns, R. B., Leung, M-C., Gest, S. D., Neckerman, H. J., & Cairns, B. D. (1988). A brief method for the assessment of interpersonal competence (ICS): Notes on reliability,

internal consistency, stability, and construct validity. Unpublished manuscript. University of North Carolina at Chapel Hill, Chapel Hill, NC.

Cairns, R. B., & Mahoney, J. L. (1997). Do extracurricular activities protect against early school dropout? Developmental Psychology, 33, 241-253.

Cairns, R. B., Perrin, J. E., & Cairns, B. D. (1985). Social structure and social cognition in early adolescence: Affiliative patterns. Journal of Early Adolescence, 5, 339-355.

Cairns, R., Xie, H., and Leung, M-C. (1998). The popularity of friendships and the neglect of social networks: Toward a new balance. In W. M. Bukowski & A. H. Cillessen (Eds.), Sociometry then and now: Building on six decades of measuring children's experiences with the peer group (pp. 25-54). San Francisco: Jossey Bass.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. Psychological Bulletin, 56, 81-105.

Chen, X. (1996, November). Peer relationships and networks and socio-emotional adjustment: A Chinese perspective. Paper presented at the Carolina Consortium on Human Development, Chapel Hill, NC.

Clarke-McLean, J. G. (1996). Social networks among incarcerated juvenile offenders. Social Development, 5, 203-217.

Cohen, J., & Cohen, P. (1975). Applied multiple regression/correlation analysis for the behavioral sciences. Hillsdale, NJ: Erlbaum.

Costanzo, P. R. (1992). External socialization and the development of adaptive individuation and social connection. In D. N. Ruble, P. R. Costanzo, & M. E. Oliveri (Eds.), The social psychology of mental health: Basic mechanisms and applications (pp. 55-80). New York: Guilford Press.

Cunningham, I. (1992). The impact of who leaders are and what they do. In K. E. Clark, M. B. Clark, & D. P. Campbell (Eds.), Impact of leadership. (pp. 249-256). Greensboro, NC: Center for Creative Leadership.

Edwards, C. A. (1994). Leadership in groups of school-age girls. Developmental Psychology, 30, 920-937.

Ekvall, G., & Arvonen, J. (1991). Change centered leadership: An extension of the two dimensional model. Scandinavian Journal of Management, 7. 17-26

Ekvall, G., & Arvonen, J. (1994). Leadership profiles, situation and effectiveness. Creativity and Innovation Management, 3. 139-161.

Elder, G. H., Jr. (1986). Military times and turning points in men's lives. Developmental Psychology, 22, 233-245.

Elder, G. H., Jr. (1996). Human lives in changing societies: Life course and developmental insights. In R. B. Cairns, G. H. Elder, Jr., & E. J. Costello (Eds.), Developmental science (pp. 31-62), Cambridge: Cambridge University Press.

Evans, M. G. (1970). The effects of supervisory behavior on the path-goal relationship. Organizational Behavior and Human Performance, 5. 277-298.

Farmer, T. W., & Cairns, R. B. (1991). Social networks and social status in emotionally disturbed children. Behavioral Disorders, 16, 288-298.

Fiedler, F. E. (1967). A theory of leadership effectiveness. New York: McGraw-Hill.

French, J., & Raven, B. H. (1959). The bases of social power. In D. Cartwright (Ed.), Studies of social power (pp.118-149), Ann Arbor, MI: University of Michigan Press.

Gabor, A. (1990). The man who discovered quality. NY: Random House.

Galton, F. (1978). Hereditary genius: An inquiry into its laws and consequences. London: J. Friedman. (Original work published 1869).

Hall, B. F. (with D. A. Wagie). (1996). The US Air Force Academy's cutting-edge character development program. Air Power Journal [On-line serial], Summer 1996, Available: http://www.cdsar.af.mil.apj.wagie.html.

Hersey, P. & Blanchard, K. H. (1969). Life cycle theory of leadership. Training and Development Journal, 23 (5). 26-34.

Hersey, P. & Blanchard, K. H. (1982). Management of organizational behavior: Utilizing human resources (4th ed.). Englewood Cliffs, NJ: Prentice Hall.

Hogan, R., Curphy, G. J., & Hogan, J. (1994). What we know about leadership: Effectiveness and personality. American Psychologist, 49, 493-504.

Hollander, E. P. (1985). Leadership and power. In G. Lindzey & E. Aronson (Eds.), Handbook of social psychology: Vol. 2. Special fields and applications (3rd ed., pp. 485-537). New York: Random House.

House, R. J. (1971). A path goal theory of leadership effectiveness. Administrative Science Quarterly, 16, 321-338.

House, R. J. & Dessler, G. (1974). The path-goal theory of leadership: Some post-hoc and a priori tests. In, J. G. Hunt & L. L. Larson (Eds.), Contingency approaches to leadership. Carbondale, IL: Southern Illinois University Press.

Hughes, R., Ginnett, R. & Curphy, G. (1996). Leadership: Enhancing the lessons of experience (2nd ed.) Chicago: Irwin.

Insko, C. A., & Schopler, J. (1972). Experimental social psychology: Text with illustrative readings. New York: Academic Press.

Kerr, S., Schriesheim, C. A., Murphy, C. J., & Stogdill, R. M. (1974). Toward a contingency of leadership based upon the consideration and initiating structure literature. Organizational Behavior and Human Performance, 12. 62-82.

Kohlberg, L. (1958). The developmental modes of moral thinking and choice in the years ten to sixteen. Reprinted in B. Puka (Series Ed.), Moral development: Vol. 3: Kohlberg's original study of moral development. (1994). New York: Garland Publishing.

Leung, M-C. (1998). SCM (Version 4.0) [Computer Software]. Chapel Hill, NC: Center for Developmental Science, University of North Carolina at Chapel Hill.

Leung, M-C. (1996). Social networks and self enhancement in Chinese children: A comparison of self reports and peer reports of group membership. Social Development, 5. 146-157.

Magnusson, D. (1988). Individual development in the paths through life: Vol. A longitudinal study. Hillsdale, NJ: Erlbaum.

Magnusson, D. & Bergman, L. R. (1990). A pattern approach to the study of pathways from childhood to adulthood. In L. N. Robins & M. Rutter (Eds.), Straight and devious pathways from childhood to adulthood (pp. 101-115). Cambridge: Cambridge University Press.

Magnusson, D. & Cairns, R. B. (1996). Developmental science: Toward a unified framework. In R. B. Cairns, G. H. Elder, Jr., & E. J. Costello (Eds.), Developmental science (pp. 7-30), Cambridge: Cambridge University Press.

Mann, R. D. (1959). A review of the relationships between personality and performance in small groups. Psychological Bulletin, 56, 241-270.

McNemar, Q. (1962). Psychological Statistics (3rd ed.). New York: Wiley.

Neckerman, H. J. (1992). A longitudinal investigation of the stability and fluidity of social networks and peer relations of children and adolescents. Unpublished doctoral dissertation, University of North Carolina at Chapel Hill.

Neckerman, H. J. (1996). The stability of social groups in childhood and adolescence: The role of the classroom social environment. Social Development, 5. 131-145.

Norusis, M. J. (1994). SPSS: SPSS professional statistics 6.1. Chicago: SPSS Inc. 1994

Nystedt, L. (1997). Who should rule? Does personality matter? European Journal of Personality, 11. 1-14.

Peters, L. H., Hartke, D. D., & Pohlmann, J. T. (1985). Fielder's Contingency theory of leadership: An application of the meta-analytic procedures of Schmidt and Hunter. Psychological Bulletin, 97. 274-285.

Raven, B. H. (1992). A power/interaction model of interpersonal influence: French and Raven thirty years later. Journal of Social Behavior and Personality, 7. 217-244.

Sampson, R. J., & Laub, J. H. (1996). Socioeconomic achievement in the life course of disadvantaged men: Military service as a turning point, circa. 1940-1965. American Sociological Review, 61, 347-367.

Shavelson, R. J. (1988). Statistical reasoning for the behavioral sciences (2nd ed.). Boston: Allyn and Bacon, Inc.

Stattin, H. & Magnusson, D. (1990). Pubertal maturation in female development. Hillsdale, NJ: Erlbaum.

Stogdill, R. M. (1948). Personal factors associated with leadership: A review of the literature. Journal of Psychology, 25. 35-71.

Stogdill, R. M. (1974). Handbook of leadership. New York: Free Press.

Tanaka, J. S., Panter, A. T., Winborne, W. C., & Huba, G. J. (1990). Theory testing in personality and social psychology with structural equation models: A primer in 20 questions. In C. Hendrick & M. S. Clark (Eds.), Review of personality and social psychology: Vol. 11: Research methods in personality and social psychology (pp. 217-242). Newbury Park, CA: Sage.

USAF Academy. (1999). USAF Academy Mission Statement [On-line]. Available: http://www.usafa.af.mil/usafa-mission.html.

USAFA Office of Institutional Research. (1998). Statistical summaries of USAFA cadets and graduates. USAF Academy, CO.

USAFA Office of Institutional Research. (1997). Descriptive characteristics and comparisons for the class of 2001. USAF Academy, CO.

USAFA Office of Institutional Research. (1995). Descriptive characteristics and comparisons for the class of 1999. USAF Academy, CO.

Vecchio, R. P. (1987). Situational leadership theory: An examination of a prescriptive theory. Journal of Applied Psychology, 72. 444-451.

Vroom, V. H. & Yetton, P. W. (1973). Leadership and decision-making. Pittsburgh: University of Pittsburgh Press.

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), Structural equation

modeling: Concepts, issues, and applications (pp. 56-75). Thousand Oaks, CA: Sage.

Xie, H. (1998). The development and function of social aggression: A narrative analysis of social exchange in interpersonal conflicts. Unpublished doctoral dissertation, University of North Carolina at Chapel Hill.

Xie, H., Cairns, R. B., & Cairns, B. D. (1996). What predicts teen parenthood: Peer affiliations or individual dispositions? Unpublished manuscript, Center for Developmental Science, University of North Carolina at Chapel Hill, Chapel Hill, NC.

Yukl, G. & Van Fleet, D. D. (1990). Theory and research on leadership in organizations. In M. D. Dunnette & L. M. Hough (Eds.), Handbook of industrial & organizational psychology. 147-197.

LONGITUDINAL STUDY OF THE SOCIAL NETWORK INFLUENCES ON THE LEADERSHIP AND PROFESSIONAL MILITARY DEVELOPMENT OF CADETS AT THE U.S. AIR FORCE ACADEMY

by

Gary A. Packard, Jr.
Lieutenant Colonel
United States Air Force

The University of North Carolina at Chapel Hill
Doctor of Philosophy
Department of Psychology (Developmental Psychology)

1999

(191 pages)

ABSTRACT

GARY A. PACKARD, JR.: Longitudinal Study of the Social Network Influences on the Leadership and Professional Military Development of Cadets at The U.S. Air Force Academy

This study investigated the influence of social networks on the leadership and professional military development of cadets at the United States Air Force Academy. Using a longitudinal design over an academic year (August 1997 to May 1998), the study examined the differences in the composition of cadet social groups and their influence on leadership development in two cadet squadrons. Cadet peer groups, identified using Social Cognitive Map procedures (Cairns, Gariépy, & Kinderman, 1990), were influential and stable components of the cadet squadron social ecology. Cadets nominated as "being a good leader" by their peers were not necessarily the same cadets holding positions of formal leadership. These "informal leaders" performed better on academic and military performance measures than other cadets in the squadron, were more respected than other cadets in the squadron, and were more central in the squadron social network. An exploratory measurement model of leadership suggested that leadership is best measured by both the formal position one holds, as well as, ratings of leadership effectiveness and respect obtained from other cadets in the squadron. Cadets who had high ratings of hostile aggression were less likely to receive peer nominations for being one of the "most respected cadets" in the squadron and less likely to be considered a leader in the squadron. These findings suggest that cadet social groups provide a rich context for leadership training and have the potential to influence leadership development trajectories. Suggestions are provided to aid in applying these findings.

References

Arbuckle, J. L. (1997). AMOS Demo (Version 3.6) [Computer software]. SmallWaters Corporation: Chicago.

Bass, B. M. (1990). Bass & Stogdill's handbook of leadership: Theory, research, and managerial applications (3rd ed.). New York: Free Press.

Bergman, L. R., & El-Khouri, B. M. (1998). ŞLIEPNER. A statistical package for pattern-oriented analysis. (Version 2.0) [Computer Software]. Stockholm: Department of Psychology, Stockholm University, Sweden.

Bost K. K., Cielinski, K. L., Newell, W. H., Vaughn, B. E., (1994). Social networks of children attending Head Start from the perspective of the child. Early Childhood Research Quarterly, 9, 441-462.

Browne, M. W. (1984). Asymptotically distribution-free methods for the analysis of covariance structures. British Journal of Mathematical and Statistical Psychology, 37, 62-83.

Burns, J. M. (1978). Leadership. New York: Harper & Row.

Cairns, R. B. (1999). The natural history and developmental functions of aggression. Manuscript in preparation.

Cairns, R. B. & Cairns, B. D. (1994). Lifelines and risks: Pathways of youth in our time. New York: Harvester Wheatshaft.

Cairns, R. B., Cairns, B. D., Neckerman, H. J., Gest, S., & Gariépy, J.-L. (1988). Social networks and aggressive behavior: Peer support or peer rejection? Developmental Psychology, 24, 815-823.

Cairns, R. B., Gariépy, J-L, & Kinderman, T. (1990). Identifying social clusters in natural settings. Unpublished manuscript. University of North Carolina at Chapel Hill, Chapel Hill, NC.

Cairns, R. B., Leung, M-C., Buchanan, L., & Cairns, B. D. (1995). Friendships and social networks in childhood and adolescence: Fluidity, reliability, and interrelations. Child Development, 66, 1330-1345.

Cairns, R. B., Leung, M-C., Gest, S. D. & Cairns, B. D. (1995). A brief method for assessing social development: Structure, reliability, stability, and developmental validity of the interpersonal competence scale. Behavioral Research and Therapy, 33, 725-736.

Cairns, R. B., Leung, M-C., Gest, S. D., Neckerman, H. J., & Cairns, B. D. (1988). A brief method for the assessment of interpersonal competence (ICS): Notes on reliability,

internal consistency, stability, and construct validity. Unpublished manuscript. University of North Carolina at Chapel Hill, Chapel Hill, NC.

Cairns, R. B., & Mahoney, J. L. (1997). Do extracurricular activities protect against early school dropout? Developmental Psychology, 33, 241-253.

Cairns, R. B., Perrin, J. E., & Cairns, B. D. (1985). Social structure and social cognition in early adolescence: Affiliative patterns. Journal of Early Adolescence, 5, 339-355.

Cairns, R., Xie, H., and Leung, M-C. (1998). The popularity of friendships and the neglect of social networks: Toward a new balance. In W. M. Bukowski & A. H. Cillessen (Eds.), Sociometry then and now: Building on six decades of measuring children's experiences with the peer group (pp. 25-54). San Francisco: Jossey Bass.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. Psychological Bulletin, 56, 81-105.

Chen, X. (1996, November). Peer relationships and networks and socio-emotional adjustment: A Chinese perspective. Paper presented at the Carolina Consortium on Human Development, Chapel Hill, NC.

Clarke-McLean, J. G. (1996). Social networks among incarcerated juvenile offenders. Social Development, 5, 203-217.

Cohen, J., & Cohen, P. (1975). Applied multiple regression/correlation analysis for the behavioral sciences. Hillsdale, NJ: Erlbaum.

Costanzo, P. R. (1992). External socialization and the development of adaptive individuation and social connection. In D. N. Ruble, P. R. Costanzo, & M. E. Oliveri (Eds.), The social psychology of mental health: Basic mechanisms and applications (pp. 55-80). New York: Guilford Press.

Cunningham, I. (1992). The impact of who leaders are and what they do. In K. E. Clark, M. B. Clark, & D. P. Campbell (Eds.), Impact of leadership. (pp. 249-256). Greensboro, NC: Center for Creative Leadership.

Edwards, C. A. (1994). Leadership in groups of school-age girls. Developmental Psychology, 30, 920-937.

Ekvall, G., & Arvonen, J. (1991). Change centered leadership: An extension of the two dimensional model. Scandinavian Journal of Management, 7. 17-26

Ekvall, G., & Arvonen, J. (1994). Leadership profiles, situation and effectiveness. Creativity and Innovation Management, 3. 139-161.

Elder, G. H., Jr. (1986). Military times and turning points in men's lives. Developmental Psychology, 22, 233-245.

Elder, G. H., Jr. (1996). Human lives in changing societies: Life course and developmental insights. In R. B. Cairns, G. H. Elder, Jr., & E. J. Costello (Eds.), Developmental science (pp. 31-62), Cambridge: Cambridge University Press.

Evans, M. G. (1970). The effects of supervisory behavior on the path-goal relationship. Organizational Behavior and Human Performance, 5. 277-298.

Farmer, T. W., & Cairns, R. B. (1991). Social networks and social status in emotionally disturbed children. Behavioral Disorders, 16, 288-298.

Fiedler, F. E. (1967). A theory of leadership effectiveness. New York: McGraw-Hill.

French, J., & Raven, B. H. (1959). The bases of social power. In D. Cartwright (Ed.), Studies of social power (pp.118-149), Ann Arbor, MI: University of Michigan Press.

Gabor, A. (1990). The man who discovered quality. NY: Random House.

Galton, F. (1978). Hereditary genius: An inquiry into its laws and consequences. London: J. Friedman. (Original work published 1869).

Hall, B. F. (with D. A. Wagie). (1996). The US Air Force Academy's cutting-edge character development program. Air Power Journal [On-line serial], Summer 1996, Available: http://www.cdsar.af.mil.apj.wagie.html.

Hersey, P. & Blanchard, K. H. (1969). Life cycle theory of leadership. Training and Development Journal, 23 (5). 26-34.

Hersey, P. & Blanchard, K. H. (1982). Management of organizational behavior: Utilizing human resources (4th ed.). Englewood Cliffs, NJ: Prentice Hall.

Hogan, R., Curphy, G. J., & Hogan, J. (1994). What we know about leadership: Effectiveness and personality. American Psychologist, 49, 493-504.

Hollander, E. P. (1985). Leadership and power. In G. Lindzey & E. Aronson (Eds.), Handbook of social psychology: Vol. 2. Special fields and applications (3rd ed., pp. 485-537). New York: Random House.

House, R. J. (1971). A path goal theory of leadership effectiveness. Administrative Science Quarterly, 16, 321-338.

House, R. J. & Dessler, G. (1974). The path-goal theory of leadership: Some post-hoc and a priori tests. In, J. G. Hunt & L. L. Larson (Eds.), Contingency approaches to leadership. Carbondale, IL: Southern Illinois University Press.

Hughes, R., Ginnett, R. & Curphy, G. (1996). Leadership: Enhancing the lessons of experience (2nd ed.) Chicago: Irwin.

Insko, C. A., & Schopler, J. (1972). Experimental social psychology: Text with illustrative readings. New York: Academic Press.

Kerr, S., Schriesheim, C. A., Murphy, C. J., & Stogdill, R. M. (1974). Toward a contingency of leadership based upon the consideration and initiating structure literature. Organizational Behavior and Human Performance, 12. 62-82.

Kohlberg, L. (1958). The developmental modes of moral thinking and choice in the years ten to sixteen. Reprinted in B. Puka (Series Ed.), Moral development: Vol. 3: Kohlberg's original study of moral development. (1994). New York: Garland Publishing.

Leung, M-C. (1998). SCM (Version 4.0) [Computer Software]. Chapel Hill, NC: Center for Developmental Science, University of North Carolina at Chapel Hill.

Leung, M-C. (1996). Social networks and self enhancement in Chinese children: A comparison of self reports and peer reports of group membership. Social Development, 5. 146-157.

Magnusson, D. (1988). Individual development in the paths through life: Vol. A longitudinal study. Hillsdale, NJ: Erlbaum.

Magnusson, D. & Bergman, L. R. (1990). A pattern approach to the study of pathways from childhood to adulthood. In L. N. Robins & M. Rutter (Eds.), Straight and devious pathways from childhood to adulthood (pp. 101-115). Cambridge: Cambridge University Press.

Magnusson, D. & Cairns, R. B. (1996). Developmental science: Toward a unified framework. In R. B. Cairns, G. H. Elder, Jr., & E. J. Costello (Eds.), Developmental science (pp. 7-30), Cambridge: Cambridge University Press.

Mann, R. D. (1959). A review of the relationships between personality and performance in small groups. Psychological Bulletin, 56, 241-270.

McNemar, Q. (1962). Psychological Statistics (3rd ed.). New York: Wiley.

Neckerman, H. J. (1992). A longitudinal investigation of the stability and fluidity of social networks and peer relations of children and adolescents. Unpublished doctoral dissertation, University of North Carolina at Chapel Hill.

Neckerman, H. J. (1996). The stability of social groups in childhood and adolescence: The role of the classroom social environment. Social Development, 5. 131-145.

Norusis, M. J. (1994). SPSS: SPSS professional statistics 6.1. Chicago: SPSS Inc. 1994

Nystedt, L. (1997). Who should rule? Does personality matter? European Journal of Personality, 11. 1-14.

Peters, L. H., Hartke, D. D., & Pohlmann, J. T. (1985). Fielder's Contingency theory of leadership: An application of the meta-analytic procedures of Schmidt and Hunter. Psychological Bulletin, 97. 274-285.

Raven, B. H. (1992). A power/interaction model of interpersonal influence: French and Raven thirty years later. Journal of Social Behavior and Personality, 7. 217-244.

Sampson, R. J., & Laub, J. H. (1996). Socioeconomic achievement in the life course of disadvantaged men: Military service as a turning point, circa. 1940-1965. American Sociological Review, 61, 347-367.

Shavelson, R. J. (1988). Statistical reasoning for the behavioral sciences (2nd ed.). Boston: Allyn and Bacon, Inc.

Stattin, H. & Magnusson, D. (1990). Pubertal maturation in female development. Hillsdale, NJ: Erlbaum.

Stogdill, R. M. (1948). Personal factors associated with leadership: A review of the literature. Journal of Psychology, 25. 35-71.

Stogdill, R. M. (1974). Handbook of leadership. New York: Free Press.

Tanaka, J. S., Panter, A. T., Winborne, W. C., & Huba, G. J. (1990). Theory testing in personality and social psychology with structural equation models: A primer in 20 questions. In C. Hendrick & M. S. Clark (Eds.), Review of personality and social psychology: Vol. 11: Research methods in personality and social psychology (pp. 217-242). Newbury Park, CA: Sage.

USAF Academy. (1999). USAF Academy Mission Statement [On-line]. Available: http://www.usafa.af.mil/usafa-mission.html.

USAFA Office of Institutional Research. (1998). Statistical summaries of USAFA cadets and graduates. USAF Academy, CO.

USAFA Office of Institutional Research. (1997). Descriptive characteristics and comparisons for the class of 2001. USAF Academy, CO.

USAFA Office of Institutional Research. (1995). Descriptive characteristics and comparisons for the class of 1999. USAF Academy, CO.

Vecchio, R. P. (1987). Situational leadership theory: An examination of a prescriptive theory. Journal of Applied Psychology, 72. 444-451.

Vroom, V. H. & Yetton, P. W. (1973). Leadership and decision-making. Pittsburgh: University of Pittsburgh Press.

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), Structural equation

modeling: Concepts, issues, and applications (pp. 56-75). Thousand Oaks, CA: Sage.

Xie, H. (1998). The development and function of social aggression: A narrative analysis of social exchange in interpersonal conflicts. Unpublished doctoral dissertation, University of North Carolina at Chapel Hill.

Xie, H., Cairns, R. B., & Cairns, B. D. (1996). What predicts teen parenthood: Peer affiliations or individual dispositions? .Unpublished manuscript, Center for Developmental Science, University of North Carolina at Chapel Hill, Chapel Hill, NC.

Yukl, G. & Van Fleet, D. D. (1990). Theory and research on leadership in organizations. In M. D. Dunnette & L. M. Hough (Eds.), Handbook of industrial & organizational psychology. 147-197.

LONGITUDINAL STUDY OF THE SOCIAL NETWORK INFLUENCES ON THE LEADERSHIP AND PROFESSIONAL MILITARY DEVELOPMENT OF CADETS AT THE U.S. AIR FORCE ACADEMY

by

Gary A. Packard, Jr.

A dissertation submitted to the faculty of The University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Psychology (Developmental Psychology).

Chapel Hill

1999

Approved by

Advisor: Professor Robert Cairns

Reader: Professor Peter Ornstein

Reader: Professor Glen Elder

Reader: Professor Phillip Costanzo

Reader: Professor Abigail Panter

Reader: Professor Robert Berger

Reader: Professor Cynthia Edwards

ABSTRACT

GARY A. PACKARD, JR.: Longitudinal Study of the Social Network Influences on the Leadership and Professional Military Development of Cadets at The U.S. Air Force Academy
(Under the direction of Robert B. Cairns)

This study investigated the influence of social networks on the leadership and professional military development of cadets. It was proposed that leadership development is a social process involving the growth of individuals as they move in a given direction toward a specified goal. At an institution such as the United States Air Force Academy, the goal is the training and development of potential Air Force leaders. This training takes place in an inherently social environment, yet studies on the relationship between social influences and leadership development are virtually non-existent. Using a longitudinal design over an academic year (August 1997 to May 1998), the study examined the differences in the composition of cadet social groups and their influence on leadership development in two cadet squadrons. Cadet peer groups, identified using Social Cognitive Map procedures (Cairns, Gariépy, & Kinderman, 1990), were influential and stable components of the cadet squadron social ecology. Cadets nominated as "being a good leader" by their peers were not necessarily the same cadets holding positions of formal leadership. These "informal leaders" performed better on academic and military performance measures than other cadets in the squadron, were more respected than other cadets in the squadron, and were more central in the squadron social network. An exploratory measurement model of leadership suggested that leadership is best measured by both the formal position one holds, as well as, ratings of

leadership effectiveness and respect obtained from other cadets in the squadron. Hostile aggression was also related to the degree of respect received from other squadron members and to measures of informal leadership. Cadets who had high ratings of hostile aggression were less likely to receive peer nominations for being one of the "most respected cadets" in the squadron. They were also less likely to be considered a leader in the squadron. Combined, the results from this study suggest that social relationships within a cadet squadron provide a rich and important context for leadership training. The characteristics of cadet social groups have the potential to influence leadership development trajectories. Several suggestions are provided to aid commanders in applying these findings.

ACKNOWLEDGMENTS

In his successful flight across the Atlantic, Charles Lindberg spent many hours alone in his thoughts and activities. However, before he could even consider such an undertaking, the combined efforts of a multitude of people ensured his success. In a similar way, I have found as a researcher that the many hours spent alone at the 'controls' of a laptop were directly and indirectly supported by the unselfish assistance of others. Although, I can never fully thank all those who made this research possible, I do want to acknowledge the generous support of all those who saw me through this dissertation.

First, I want to thank my mentor and committee chair, Dr. Robert Cairns, for his willingness to take on a graduate student who had a different agenda and a different time table than most. His advice, insight, patience, and understanding will always be appreciated. I would also like to thank the members of my committee, Dr. Peter Ornstein, Dr. Glen Elder, Dr. Phil Costanzo, Lt. Col. Robert Berger, Dr. Abigail Panter, and Dr. Cynthia Edwards for guiding me through the many steps of my research and education. They each provided a unique and essential perspective to my work and it is much the better for it. The study could not have been done without the cooperation of the fine men and women of the two squadrons of cadets who participated in the study. I thank them and their leadership for sharing a part of their lives with me.

Dr. Man-Chi Leung, Dr. Patrick Curran, and Adam Halfdal were very helpful in providing statistical and data management guidance. Dr. Miriam Fultz, Capt. Marilyn

McCombe, and Ms. Carol Burbridge provided much help in coordinating this study and coding the data at the Air Force Academy. Dr. Hong-Ling Xie, Dr. Joe Mahoney, Dr. Gerry Larsson, and Dr. Lars Bergman also provided insights both in terms of methodology and in terms of theory and application. Special thanks go out to friends and fellow students, especially David Estell, LeShawndra Price, Dan Bauer, and Kevin Pelphrey, who often provided support, encouragement, and good ideas over meals on Franklin St. Dorothy and Scott Sander were excellent proofreaders and are wonderful friends. I need to single out a special friend and colleague, Tom Cadwallader, not only for his willingness to listen to every idea I had and for providing a perspective on this study that was invaluable but also for his friendship and the important relationship between his family and mine. The help of friends and colleagues proves to me first hand that development is indeed embedded in close relationships in one's social context.

Finally, I wish to thank a special group of friends and my family. The congregation of Cornerstone Bible Church, especially our Pastor and his family, Steve and Joyce Young, who uplifted me spiritually when I was down, cared for my family when I was working, and helped me keep my values in proper order. But, the most gratitude goes out to my family. To my parents, Gary and Bernice Packard, and to my wife's parents, Jim and Sue Davis, thanks for supporting me and my family through these long years of school. To my children, Mark, David, Jacob, and Grace, thank you for letting your daddy be a student even when he would rather have been playing with you. And, finally but certainly most importantly, a special thank you to my wife, Jill, who throughout my career has been my constant source of strength, wisdom, encouragement, and happiness.

CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

Chapter 1
The Problem

Leadership research has evolved from studies focusing primarily on the characteristics of good or effective leaders (Stogdill, 1948) to a focus on the leader within the specific context of the leadership environment (Fiedler, 1967; Hersey & Blanchard, 1969, 1982; House & Dessler, 1974). In an extensive review of the leadership literature, Bass (1990) comments that studies emphasizing change or leadership development are virtually absent in the literature. Studies emphasizing change would be especially salient in populations that are in a period of developmental transition. For example, as young adults transition from adolescence through college and into the adult working world, what are the processes and experiences that shape their future leadership skills and behavior? Since peer groups are an especially salient aspect of the adolescent and young adult world, it would be logical that peer group structures and relationships would have an important role in leadership development during this period of transition. This study investigated the relationship between leadership development and social influences among cadets at the United States Air Force Academy. Specifically, this research seeks to answer the question, 'How do peer group dynamics influence the leadership development of cadets during their four years at the Air Force Academy?'

The mission of the United States Air Force Academy is to, "Inspire and develop outstanding young men and women to become Air Force officers with knowledge, character and discipline; motivated to lead the world's greatest aerospace force in service to the nation"

(USAF Academy, 1999). Since its beginning in 1955, the Air Force Academy has provided leadership training to cadets through a combination of practical leadership experience and classroom instruction. However, studies of the mechanisms fostering leadership development of cadets are virtually nonexistent. This study was conducted as a first step in discovering the processes involved in shaping leadership among cadets at the Air Force Academy.

During their four-year tenure at a service academy, each cadet obtains a Bachelor's of Science degree and is commissioned as a junior officer (second lieutenant or ensign) in the military. Each service academy has character and leadership development programs emphasizing military values and guiding cadets in the transition from civilian life to commissioned officer in the military. While these programs have gathered positive evaluations through surveys of cadets (Hall, 1996), studies are needed which seek to identify the links between leadership success and developmental processes in a military academy environment. Leadership research is often the result of organizational studies focused on the skills and behaviors of effective leaders. However, little research has been done that investigates how leadership develops in the life history of the individual and the factors which promote leadership development during one's lifespan.

Traditional Theories of Leadership

Leader Trait Approaches

From the beginning of psychology until just after World War II, most efforts at defining "the great leader" emphasized leader traits to the exclusion of follower and situation variables. For example, early in the history of psychology, Galton (1869/1978) studied inherited leadership traits in the hereditary continuity of prominent citizens. "Leader trait"

approaches continued to predominate the literature through the middle of this century (Hollander, 1985) and were summarized in Stogdill's (1948) review. Stogdill found that individual studies commonly reported that leaders differed from followers in terms of abilities and traits such as intelligence, popularity, judgment, and sociability but the totality of the research was replete with mixed results showing little or no consistent differences in the traits of leaders or followers. Stogdill (1948) suggested that the research conducted up to that point was only part of the picture. He noted, "It is not especially difficult to find persons who are leaders. It is quite another matter to place these persons in different situations where they will be able to function as leaders. It becomes clear that an adequate analysis of leadership involves not only study of leaders but also of situations" (p. 65).

Mann's (1959) review also indicated that the correlation between leader traits and leader effectiveness was tenuous. He reported that the most reliable correlation was between intelligence and leadership. Leaders tend to be more intelligent but the relationship is weak and leader traits tend to show little consistency over varying situations. Later reviews of the relationship between leader traits and leadership effectiveness continued to show mixed results (Insko & Schopler, 1972). Insko and Schopler conclude, "It is likely that for a group to optimize its efficiency and harmony, the requisite leader characteristics must interact with process features of the group and the nature of the group's goals" (p. 420).

More recent attempts at correlating leadership effectiveness with leadership traits have focused on combining individual traits into latent constructs such as the "big five" personality traits. In their summary of the research, Hogan, Curphy, & Hogan (1994) conclude that a consistent positive association exists between the dimensions of surgency, agreeableness, and emotional stability and being identified as a leader in leaderless

discussion groups. However, most leadership situations outside the laboratory involve leading an existing group with a corporate history and pre-established patterns of behavior. Therefore, the ability of leader trait approaches to predict leadership success in existing organizations is not clear.

Leader Behaviors

In the 1940's, the emphasis in leadership studies began to switch from leadership traits to leadership behaviors (Hollander, 1985). These studies looked at patterns of leader behavior and identified two main types of leader behavior: "behavior focused on task achievement, and that oriented towards interpersonal relations" (Nystedt, 1997, p. 4). In Stogdill's (1974) revised review of the research, he concluded that the most effective leaders are those who rate highest on both scales of leadership effectiveness. However, this effectiveness can be mediated by a variety of situational factors such as job stress, interest in the task, and task ambiguity (Kerr, Schriesheim, Murphy, & Stogdill, 1974). Of the two behaviors, interpersonal relations behavior seems to be less influenced by these types of situational variables than task achievement behaviors (Hollander, 1985).

Current theory on leadership behaviors has suggested that the addition of a third dimension to the current two factor model of leadership effectiveness (task and relationship behaviors) may better describe the leadership dynamic.[1] Ekvall and Arvonen (1991, 1994) have proposed a third factor of development and change in which the leader's behaviors are analyzed in terms of their visionary or future oriented qualities. Important behaviors along this dimension include creative thinking and promoting change and development in

[1]It can be argued that the two-factor conceptualization of leadership behavior is flawed from the beginning because it is not possible to neatly categorize leadership into relationship and task behaviors (Yukl & Van Fleet, 1990). However, these models can be useful for the design and conduct of research and training.

subordinates. Recent research in Sweden (M. Sverke, personal communication, June 10, 1997) has suggested the two dimensions of leadership behaviors (relationship and task) be supplemented by a third behavior which involves the leader's reaction to change in the work environment. This third dimension adds a potentially important piece to the leadership situation in that it brings in situational variables along with an acknowledgment of the changing face of leadership in the highly mobile and dynamic work environment of the 1990's.

Like the trait approach, leadership behavior approaches do not typically consider contextual factors when interpreting the effects of leader behavior on leadership effectiveness. In addition, leader behaviors are not typically measured directly but are *follower interpretations* of leader behavior (Hollander, 1985).

Situational and Contingency Approaches

Situational and contingency approaches to leadership research have focused on the interactive nature of leadership as a process involving not only the leader but also the followers and the immediate leadership environment (Fiedler, 1967; Hersey & Blanchard, 1969, 1982; Evans, 1970; House, 1971; House and Dessler, 1974; Burns, 1978; Hughes, Ginnett, & Curphy, 1996; Vroom and Yetton, 1973). A complete review of these theories has been done elsewhere (see Bass, 1990; Hollander, 1985), so a summary of the contingency approach will be highlighted here.

Contingency approaches extend the traditional trait and behavior approaches to include interactions with followers in a given leadership context when predicting leadership success. Leaders are conceptualized as either static and fairly stable in their behaviors or flexible and fairly adaptable in their behavior within the current leadership situation.

Fiedler's Contingency Theory (1967) is an example of the static approach. In this theory, the successful leader either selects situations matching his leadership behavior or works to modify the existing situation to match his leadership style. Path-Goal Theory (Evans, 1970; House & Dresser, 1974) is an example of a theory that assumes leaders adapt their behavior to the current situation. In this theory, leaders not only use different styles with different followers, but also use different styles in different situations, including different situations with the same set of followers. Another flexible leader approach, Situational Leadership Theory (SLT, Hersey and Blanchard, 1969, 1982), suggests that successful leaders are able to analyze follower maturity in relation to the job task and modify their behavior to the needs of the follower.

While incorporating follower and situational variables was an advancement over leader trait and leader behavior approaches, contingency approaches have received mixed research support. A meta-analysis of Fiedler's Contingency Theory found that the theory is fairly accurate in laboratory settings but it does not fully capture the complex nature of leadership based on field research (Peters, Hartke, & Pohlmann, 1985). SLT has also received mixed (and sparse) research support (Vecchio, 1987; Yukl & Van Fleet, 1990).

Follower Perception Approaches

Transformational leadership and charismatic leadership, place more emphasis on the follower perceptions of leadership effectiveness than the theories discussed so far. These theories go beyond the strict emphasis on the leader's traits and behaviors in a given context and incorporate into the model the match of the leader to the expectations and values of the follower. For example, Burns' (1978) theory links leadership behavior to follower values and expectations. Two types of leaders are proposed. Transactional leaders try to satisfy

mutually beneficial needs and desires of the leader and the followers. They see the relationship as a means to arrive at a mutually beneficial end for the leader and the follower. Transformational leaders operate by appealing to the follower's sense of a higher purpose or greater good. These ideas are similar to Kohlberg's (1958) stages of moral development. Transactional leaders use level II moral reasoning (conventional or following the expectancies of others) while transformational leaders use level III moral reasoning (post-conventional or principle oriented). However, unlike Kohlberg's stages which are conceptualized as developmentally sequential stages, the distinction between transformational and transactional leadership is not developmental in nature. These two types of leaders are seen as being uniquely different in their approach to leading and one style does not necessarily precede the other.

Leadership, Development, and Social Influence

Cunningham (1992) observes that leadership is a concept worthy of study, but that the research conducted to date has focused too much on the content of what leaders say and do and not enough on the processes and patterns behind the actions. He does not suggest eliminating studies on the content (i.e., leader behaviors and interactions with others) but suggests more emphasis on the processes which lead to effective leadership behavior. Similarly, Bass (1990) observes, "Leadership development is a continuing process. Thus researchers need to learn a lot more about how experiences with subordinates, peers, and superiors, as well as with family and friends, shapes one's subsequent performance as a leader" (p. 911).

The role of peers in selecting leaders is a ubiquitous phenomenon in childhood and adolescence, including student government elections from elementary school through

college. However, few studies have attempted to capture the role of peer group influences in the leadership development of young people who are leaders. Edwards (1994), in one of the few studies on leadership in childhood, investigated how Girl Scout troops used peer nominations, adult ratings, and elected leadership status as a measure of leadership. She found informal leadership, but not elective leadership, to be both stable and predictable from personal characteristics. It was easier to predict the informal leaders in the group by their personal characteristics than to predict formal leaders.

Informal and formal leadership coexist in most organizations. At the U. S. Air Force Academy, the formal leadership structure changes from semester to semester. In an effort to provide leadership opportunities for all cadets, formal positions of leadership at the Air Force Academy rotate periodically, usually at the beginning of each semester and during summer training periods. The purpose of these rotations is to provide equitable leadership opportunities for all cadets. There are a limited number of formal leadership positions and not all cadets will have or take the opportunity to occupy a formal leadership role.

Cadets enter the Academy on fairly equal footing in terms of leadership experience. For example, recent demographic statistics report that 92.3% finished in the top quarter of their graduating class, 21% were high school class president or vice-president, 85% earned one or more varsity sports letters, and about 25% attended Boy's/Girl's State or Nation (USAFA Office of Institutional Research, 1995).

These statistics suggest that cadets enter the Air Force Academy on fairly equal footing in terms of prior academic and leadership experiences. Yet, during their four years at the Academy, some cadets perform extremely well while others struggle to graduate. What creates this difference in performance? Some of the difference is likely due to pre-entry

conditions such as the quality of a cadet's high school education, a cadet's prior experience with the military (through parents who were in the military or ROTC programs), and the individual characteristics and abilities of the cadets. It is also likely that the manner in which a cadet interacts with his peers while at the Academy may accentuate or attenuate his potential. For example, if a cadet with high potential hangs out with a group of cadets who seek to cause trouble, then that cadet may not live up to his pre-entry aptitude. How the cadet adapts socially to the Academy environment is likely a major influence on the developmental trajectory a cadet travels.

If cadets enter with roughly equal aptitudes for leadership and academic performance, then cadets seeking to lead will have to find some way to distinguish themselves from their classmates. Through the use of power, cadets may be able to become influential members of the squadron. French and Raven (1959) identified five bases of power. Legitimate power is based on position and stems from legitimate authority. Reward power is the ability to give out rewards to others. Coercive power is the ability to administer punishment or negative consequences. Referent power is power obtained through relationships or friendships. Finally, expert power is the power of knowledge. In the lives of cadets, there are fairly equal levels of expertness in terms of how the Academy system runs and ways to get things done. Also, since legitimate authority rotates each semester when the squadron staff changes, appeals to legitimate power are difficult to make. The rewards and punishments available to cadets are equal since freedoms, punishments, and privileges are highly regulated. Thus, the

ability to effectively use a referent power base may be important in distinguishing leaders and nonleaders in the squadron.[2]

It is proposed that because informal leadership structures are likely to capitalize on this referent power base, peer social networks become important in the leadership development of cadets. Whether a cadet hangs out within the official leadership structure or affiliates with individuals outside of the formal military hierarchy could influence their professional development. Researchers have shown that peers can have a large influence on the behaviors of an individual. It is commonly found in the analysis of social networks that peers tend to associate with individuals who are most like them (homophily) (Cairns & Cairns, 1994; Clarke-McLean, 1996) and who are together a lot because of classroom or other group assignment (propinquity) (Neckerman, 1996; Bost, Cielinski, Newell, & Vaughn, 1994). This effect of propinquity and homophily has been shown to hold across cultures as well (Stattin & Magnusson, 1990; Leung 1996; Chen, 1996). This finding is robust and is consistent regardless of the methodology used to identify social influences (peer networks, best friend nominations, etc., see Cairns, Gariépy, & Kinderman (1990) and Cairns, Xie, & Leung (1998) for reviews of differing methods of social network analysis).

Related research has been done on how peer group and social influences are interwoven with behavioral outcomes. This research has focused on the link between individual disposition and peer influence on negative developmental outcomes. For example, Xie, Cairns, & Cairns (1996), studied the individual dispositional and social factors correlated with teenage pregnancy. By clustering males and females into homogenous

---

[2] In an update of the French & Raven taxonomy of power, Raven (1992) added information power as a sixth base of power. As with expert power, it is not likely that information power would vary significantly from cadet to cadet. Thus, like expert power it is not likely to be a major source of power differences among cadets.

groups before or during early puberty, they found a higher correlation with teen pregnancy if they included both the average characteristics of one's peer group and the characteristics of the individual (see also Cairns & Cairns, 1994, for a discussion of aggressive behavior and social group affiliation).

Nystedt (1997) suggests that the study of leadership needs to involve the "study of the whole person in context to obtain an in-depth understanding of the importance of leadership in organizations, and by that reduce fragmentation into individual functioning" (p. 12). Certainly, this approach to leadership study would help to disentangle many of the shortcomings of the prior research on leadership and leadership development. To completely understand the leadership development process, the person needs to be studied both in context and over time. This suggests that person-centered research would be an important methodology to introduce to leadership development research.

Person-centered approaches (Magnusson, 1988; Magnusson & Bergman, 1990) used to identify similar clusters of individuals would assist in "identifying how configurations of characteristics affect individual functioning over time" (Magnusson & Cairns, 1996, p. 25). Research using this approach in Sweden and the United States has found important predictors of both deviant and pro-social behaviors in adolescence (i.e., Cairns & Cairns, 1994; Cairns & Mahoney, 1997; Stattin & Magnusson, 1990). Person-centered methods applied to leadership development research will allow investigators to disentangle developmental trajectories as they are embedded in social realities. As Costanzo (1992) observes, "Not only is the individual found in society, but society is found in the individual" (p. 73).

It is proposed that the inculcation of leadership is neither an isolated effort of learning a specific theory nor solely the result of changes in individual cognitive development.

Instead, it is a matter of how the individual adapts to and internalizes socially defined norms of behavior. These norms of behavior are defined by the larger organization but are made salient to the individual via the interpretation of institutional rules in the immediate social context (peer group). How one's peer group interprets the appropriate leadership behavior within the institution and passes this interpretation on to group members will likely have a dramatic effect on individual leadership development. This study uses information from the cadet social ecology to study how the composition of cadet peer groups can be used to better understand cadet leadership development.

Studying Leadership in the Social Context

Before being able to study the correlation of peer group influence and leadership development, measures of both peer groups and leadership needed to be selected. In a recent review of the sociometric methodology, Cairns, Xie, and Leung (1998) report that no one method for identifying social groups and social influence has been agreed upon in developmental psychology. The various methods available have different strengths and weaknesses in terms of mathematical assumptions, participation rates required for accurate analysis, and the level of the social network captured by the procedure. For this study, social cognitive mapping (SCM) procedure (Cairns, Gariépy, & Kinderman, 1990) was selected because of its ability to capture existing groups within a given setting.

The SCM procedure measures the centrality of the groups and individuals in the peer social network in the squadron on the basis of the frequency of nominations that both an individual and the individual's peer group(s) receive on the question, "Who in the squadron hangs out together?" The SCM centrality measure is different than a popularity measure in that respondents are not being asked to provide judgments about who is the best, brightest, or

most popular in the squadron. By asking cadets to name other groups and not just their own peer or friendship network, the procedure extends the information obtained from each informant to the social organization of the entire unit. It yields social structure and social status information about all persons and groups in the unit even if all persons do not participate. The procedure presupposes that (a) persons in the unit have cognitive representations of the social structure and social ecology of part of the unit and (b) these cognitive representations are similar for persons in the same social-ecological niches (Cairns, Xie, & Leung, 1998). By asking cadets to name peer groups, the most frequently named individuals of the most frequently identified groups may be identified as central members of the organization. This centrality measure can then be correlated to leadership status, respect, and performance to determine whether the most central individuals are viewed as formal or informal leaders.

The SCM procedure also allows for the analysis of group stability over the school year. If peer groups remain stable, then the peer group influence is a consistent part of the cadet developmental experience. For example, if deviant peer groups can be identified at the beginning of the semester and these peer groups remain stable influences over the school year, members of these groups would be expected to have higher rates of probation and disenrollment than members of other, less deviant peer groups.

For this study, two types of leadership will be studied. First, informal leadership will be measured by peer nominations for the best leaders in the squadron. Second, formal leadership measures will be available based on self-reports of leadership position and by accessing official record information on cadet jobs in the squadron. In addition, measures of

leadership effectiveness will be available from self-ratings, cadet supervisor ratings, and military performance averages (MPA) in cadet records.

By combining social network information with leadership status and measures of leadership effectiveness, the interplay between a cadet's social world and a cadet's leadership development can be studied. Leadership is an inherently social experience. By including social phenomena in the study of leadership, the processes which bring about effective leadership development can be more fully understood. The following specific aims and hypotheses will be studied using this methodology.

Aims and Hypotheses

Aim 1. Identification of peer social networks at the US Air Force Academy. *Hypotheses*:

a. Cadets will form groups based primarily on propinquity (most groups will be within the squadron with few groups extending outside the squadron) and homophily (cadets will seek networks with similar values and preferences).

b. Cadets will affiliate primarily with cadets in their class, with the strength of this affiliation declining over the four years at the Academy.

c. Networks which extend outside the squadron boundary will be primarily comprised of cadets involved in wing wide activities (i.e., intercollegiate athletics, wing or group staffs, debate team, etc.).

Aim 2. Measure the stability of peer networks over a one academic year period (August 1997 - May 1998). *Hypotheses*:

a. Cadet peer groups will be stable over the school year and cadets who change network affiliations will be likely to join new networks with similar characteristics (similar

group behaviors and characteristics as well as similar centrality of the groups and individual group members).

b. Most changes in peer groups over the school year will occur in the freshman and junior class which will have only been together since June (freshman) or August (junior). Sophomores and seniors who have been together for one full year prior to the study will show higher stability in peer networks over the school year.

c. Network centrality will remain stable over the school year. Individuals who have high network centrality at the beginning of the semester will be likely to have high network centrality at the end of the semester.

Aim 3. Improve the understanding of the relationship between formal leadership hierarchies and informal leadership structures within squadrons at the US Air Force Academy.

Hypotheses:

a. Formal and informal leaders will often be different people. Of these, informal leaders will maintain higher stability because formal leadership positions rotate on a semester basis.

b. Informal leaders will be most likely to be well respected and admired. Informal leaders will be the most central members of the social network.

c. Centrality within the social network will have a positive relationship to measures of leadership and performance. More central members of the social network will be nominated as leaders more often by their peers, will be more likely to be in positions of leadership, and will have higher ratings on military performance averages.

Aim 4. Investigate the ability of peer group characteristics and influences to predict the development of leadership behaviors which either improve or degrade an individual's

likelihood of completing a year at the academy as measured by performance averages (military, academic, and athletic), probation (conduct, aptitude, athletic, academic, honor), formal leadership position, and retention (retained, voluntary disenrollment, involuntary disenrollment). *Hypothesis*: The characteristics of a cadet's peer group will be as good at predicting success or failure at the Academy as individual characteristics and measures. By combining individual predictors with the characteristics of a cadet's peer group, the best prediction of final performance ratings will be possible.

Aim 5. Provide recommendations on ways to enhance leadership training through a better understanding of the social forces in the squadron.

Chapter 2
Research Design, Methods, and Procedures

This study was conducted at the United States Air Force Academy during the 1997-1998 academic school year (August 1997 to May 1998). The Academy is an accredited college which provides training and education to a portion of the future officers of the U. S. military. Cadets at the U. S. Air Force Academy are 17 to 25 years old, unmarried, and live in one of two cadet dormitories. Cadets are normally billeted two or three to a room, although occasionally a cadet may have a single room. Males and females are in separate rooms but live on the same hallway as all other cadets in their squadron. The Academy has a total strength of slightly more than 4000 cadets. Cadets participate in a daily regimen of academic, military, and physical education training and activities. The typical cadet day begins at about 6:00 a.m. and ends with the sounding of taps at 11:00 p.m.

All cadets are required to complete their training and education in four years with the exception of a small number of cadets who apply for a one to two year leave of absence for personal reasons or to complete religious missions. Cadets graduate from the Academy with a Bachelor of Science degree and are commissioned a second lieutenant or ensign in the military. Most cadets are commissioned in the Air Force but a small portion are commissioned in the other branches of military service. In addition, each class contains a small number of international students who are commissioned in their home country's military. Entry in to the Academy is highly competitive and most cadets begin the application process during their junior year in high school. Most cadets enter the Academy

directly from high school, although a small portion of each graduating class has prior military or college experience. For the classes of 1998 to 2001, 13% attended a military preparatory school prior to entering the Air Force Academy and 1% entered directly from prior military experience (regular, reserve, or guard duty) (USAFA Office of Institutional Research, 1997).

The entire body of cadets is referred to as the cadet wing. The organizational structure of the cadet wing is designed to mirror the structure of an active duty Air Force wing. A wing staff, consisting of junior and senior cadets, is in charge of leading and managing the wing. Below the wing level, cadets are divided in to four cadet groups of about 1000 cadets each. As in the cadet wing, each cadet group is led by junior and senior cadets. Within each group are 10 squadrons for a total of 40 cadet squadrons. Squadrons live together in the dormitories and most cadet activity involves participation with their cadet squadrons. The cadet squadron is the primary organization with which most cadets closely identify. The squadron is also led by junior and senior cadets. All cadet leaders serve for one semester. During an academic year, the wing, group, and squadron leadership changes between the fall and spring semester. All cadet activities are supervised by Air Force officers, noncommissioned officers, and civilian government employees along with a small number of exchange officers from other branches of the military.

Since most cadet interactions occur within a cadet squadron, this study uses the squadron as the primary unit for data collection. A cadet squadron has approximately 100 cadets equally representing the four classes of cadets at the Academy. First class cadets (seniors) serve as the officers in the squadron, second class cadets (juniors) are the equivalent of senior noncommissioned officers, third class cadets (sophomores) are the equivalent of junior noncommissioned officers, and fourth class cadets (freshmen) are the equivalent of

junior enlisted personnel. As a cadet moves up in the class structure, they are given additional responsibilities and privileges. Fourth Class cadets have limited off-base passes, cannot visit other squadrons, must address upper class cadets as "sir" or "ma'am", are required to learn Air Force knowledge, and perform many of the cleaning and routine administrative tasks required in the squadron. The fourth class system lasts until approximately the middle of the spring semester of a cadet's first year. Once recognized as an upper class cadet, all cadets are on a first name basis but cadets in leadership positions have the authority to limit passes, provide rewards, and conduct training of cadets they directly supervise.

Study Participants

Two cadet squadrons participated in the study. The selection of the squadrons was done by the Office of Institutional Research at the Academy. The Office of Institutional Research is the coordinating office for all research conducted with cadets and is responsible for selecting study participants to ensure cadets have equitable participation in research and surveys. The original study design requested the selection of one squadron from the top 25% of the squadrons at the Academy based on end of year rankings from the year prior (high performing squadron) and one squadron from the bottom 25% (low performing squadron) in order to study the differences in performance both between individuals within a squadron and between the two squadrons.

After the study began, the investigator (GP) was informed that one squadron was ranked at about the 50th percentile of the squadrons at the Academy and the other squadron was ranked at about the 67th percentile (exact rankings and squadron identification are masked to protect the confidentiality of the participants). The squadron that began at about

the 50th percentile improved just under ten positions to be ranked just below the 25th percentile at the end of the study. The squadron beginning at the 67th percentile improved over 20 positions to be ranked near the 15th percentile at the end of the study. The original lower squadron switched positions in the squadron rankings with the original higher squadron. The squadron with the greatest improvement (moving from the third quartile to the top quartile) was designated squadron H (higher performing) whereas the other squadron that less improvement was designated squadron A (average performing).

Squadron A had 25 First Class cadets, 29 Second Class cadets, 28 Third Class cadets, 27 Fourth Class cadets, and one cadet who did not have class information for a total of 110 cadets. Squadron H had 23 First Class cadets, 28 Second Class cadets, 24 Third Class cadets, and 24 Fourth Class cadets for a total of 99 cadets. Table 2.1 shows the gender and race make-up of each squadron and the Academy. Table 2.2 shows participation rates for each squadron by class, race, and gender.

Participation was not as high as initially expected because of the high demands on cadet time and the voluntary nature of participation. In Squadron A, 101 (92%) cadets participated in at least one time point. Of these, 62 (57%) cadets participated in at least two of three time points and 20 (18%) cadets participated in all three time points. Ten cadets (9%) did not participate at any time point. In Squadron H, 86 (86%) cadets participated in at least one time point. Of these, 67 (67%) cadets participated in at least two of three time points and 38 (38%) cadets participated in all three time points. Thirteen (13%) cadets did not participate at any time point.

Table 2.1. Gender and Race of Participating Squadrons.

	Squadron A	Squadron H	Academy Population
Strength by Gender			
Male	82 (82%)	73 (85%)	86%
Female	18 (18%)	13 (15%)	14%
Strength by Race			
Black	7 (7%)	4 (5%)	4%
Hispanic	9 (9%)	6 (7%)	6%
Native American	1 (1%)	3 (3%)	1%
Asian/Pacific	4 (4%)	4 (5%)	4%
White	76 (76%)	69 (80%)	84%
International/Exchange	2 (2%)	0 (0%)	1%

Notes: Academy-wide data are based on entry data for each class (USAFA Office of Institutional Research, 1997, 1998). Squadron data reported is from time point one. Gender and Race numbers do not equal full squadron strength because 10 cadets from squadron A and 13 cadets from squadron H did not give permission to access their personnel records at any of the three data collection points.

Table 2.2. Cadet Participation Rates by Class, Gender, and Race at each Time Point.

	Time 1		Time 2		Time 3	
	Squad. A	Squad. H	Squad. A	Squad. H	Squad. A	Squad. H
participation by class						
1998 (senior)	13 (27%)	14 (20%)	12 (16%)	10 (20%)	15 (26%)	16 (23%)
1999 (junior)	14 (29%)	16 (23%)	19 (26%)	15 (31%)	12 (21%)	18 (25%)
2000 (sophomore)	10 (21%)	21 (30%)	20 (27%)	7 (14%)	13 (22%)	18 (25%)
2001 (freshman)	11 (23%)	20 (28%)	23 (31%)	17 (35%)	18 (31%)	19 (27%)
participation by gender						
Male	42 (87%)	59 (83%)	60 (81%)	42 (86%)	46 (81%)	61 (86%)
Female	6 (13%)	12 (17%)	14 (19%)	7 (14%)	11 (19%)	10 (14%)
participation by race						
Black	2 (4%)	2 (3%)	4 (5%)	1 (2%)	5 (9%)	2 (3%)
Hispanic	7 (15%)	5 (7%)	4 (5%)	3 (6%)	4 (7%)	5 (7%)
Native American	0 (0%)	3 (4%)	0 (0%)	1 (2%)	1 (2%)	2 (3%)
Asian/Pacific	3 (6%)	4 (6%)	5 (7%)	4 (8%)	3 (5%)	3 (4%)
White	34 (71%)	57 (80%)	60 (81%)	40 (82%)	42 (74%)	59 (83%)
International/ Exchange	2 (4%)	0 (0%)	1 (1%)	0 (0%)	2 (4%)	0 (0%)
Total Participation	48 (43%)	71 (72%)	74 (67%)	49 (49%)	58 (53%)	71 (72%)

Notes: Percentages for total participation is percent of all squadron members. Percentages for all other entries is percent of cadets participating at that time point. One cadet at time 3 in squadron A did not provide gender or race information.

Design

The research was designed with both a longitudinal and a cross-sectional component. The longitudinal component consisted of three data collection points over the academic year: T_1, at the beginning of the fall semester in August of 1997, T_2 at the end of fall semester in November of 1997, and T_3 at the end of spring semester in late April and early May of 1998. The cross-sectional component consisted of data collected on all four classes of cadets (freshman, sophomore, junior, and senior classes). This procedure enabled the data to be analyzed between classes, as well as, across an eight month period within each class.

Measures

Survey Part I - Self-Report Survey Instrument

Surveys were administered to participating cadets at all three time points. The first two pages were identical cover letters with information about the research along with informed consent information. Participants were instructed to remove the first copy of the letter and retain it for their files. The second copy was signed by the participant and returned to the survey administrator. The survey was composed of four parts each of which is described below. With the exception of the first seven questions, the surveys were identical at each time point. A copy of the survey administered at T_1 with the cover letters is located in Appendix A. The questions which differed on the surveys administered at T_2 and T_3 follow the T_1 survey in Appendix A.

Background and Demographic Questions

The first seven questions comprised the background portion of the survey. These questions collected data on demographics, parent and sibling military service, leadership positions, probation status, intercollegiate athletics, extracurricular activity participation,

experiences and awards from before Academy entry, and attitudes toward the quality of Academy training programs. The questions on leadership positions and probation status were identical for all three time points. The remaining questions varied at each time point.

Self-Report on the Interpersonal Competence Scale - Leaders (ICS-L)

The second part of the survey (questions 8-23) was based on the interpersonal competence scale (ICS) developed by Cairns and colleagues (Cairns & Cairns, 1994; Cairns, Leung, Gest, & Cairns, 1995; Cairns, Leung, Gest, Neckerman, & Cairns, 1988). The ICS has two identical versions: The ICS-T (teacher) is filled out by a teacher or other adult and the ICS-S (self) is self-report. The ICS measures have proven to be both easy to administer and psychometrically robust in terms of structure, reliability, stability, and validity based on nine years of longitudinal data collection (Cairns, et. al., 1995).

The ICS measures are unidimensional, seven-point bipolar scales. Extremes are randomly assigned so that positive and negative responses are available on both the left and right side of the scale. For this research, a variation of the original ICS was developed. The modifications to the original ICS were made in order to accurately reflect the higher reading level of service academy cadets and to more accurately reflect the social environment of the Air Force Academy yet retain the same latent constructs. A side-by-side comparison of the original ICS and the modified ICS-L is presented in Table 2.3.

Four of the original ICS items remained unchanged in the ICS-L (argues, smiles, wins, friendly). The remaining eleven items were modified slightly and an item related to politics was added as a filler item. The filler item was added because of the high face validity of the instrument in order to provide a means to cross-check the loadings of the individual items in factor analysis. The politics item was unrelated to other items on the

scale and did not load on any factor. The item on trouble had the words "at school" removed because cadet life involves many activities outside of academics. Also, demerits and other consequences of getting "in trouble" are more likely to be associated with military activities than school. The popularity item was altered to remove reference to boys or girls and a single item of popularity was included. The second popularity item was reworded as a respect item. It was felt that respect was a similar construct to popularity, especially within the cadet population.

The two school subject items were changed from spelling and math to fuzzy studies and engineering courses. Fuzzy studies is a cadet term for humanities and social science courses. Engineering courses are a big part of the curriculum and engineering majors are considered to be the most difficult in terms of math and analytical ability. The item for friends was changed from "lots of friends" to "many friends" and the "good at sports" item was reworded to "athletic - not athletic" to simplify the wording.

Asking other cadets if a subordinate is "good looking" might be problematic for some cadets, therefore this item was altered by adding "in uniform" to the item. Thus, it becomes a measure of uniform wear and overall military appearance and not just physical attractiveness. Since physical fighting is not a common cadet experience, the original fighting item was reworded to "hostile - not hostile". Finally, two of the original items were related to infrequent cadet behaviors or attitudes. The first dealt with getting one's own way. This item was changed to "leader - not a leader" to still address the construct of being in charge and making decisions yet stay consistent with college age vocabulary and the thesis of this study.

Table 2.3: Side-by-Side Comparison of the ICS-T and the ICS-L.

ICS-T Items (Original Instrument)	ICS-L Items (Academy Sample)
never argues - always argues	never argues - always argues
always in trouble at school - never in trouble at school	always in trouble - never in trouble
always smiles - never smiles	always smiles - never smiles
not popular with boys - very popular with boys	well respected - not respected
very good at sports - not good at sports	not athletic - athletic
very good looking - not good looking	looks good in uniform - doesn't look good in uniform
very good at spelling - not good at spelling	very good in fuzzy studies* - not very good in fuzzy studies
always gets in a fight - never gets in a fight	hostile - not hostile
not good at math - very good at math	not very good in engineering - very good in engineering
very popular with the girls - not popular with the girls	very popular - not popular
lots of friends - no friends	many friends - no friends
never gets their way - always gets their way	a leader - not a leader
wins a lot - never wins	wins a lot - never wins
never friendly - always friendly	always friendly - never friendly
cries a lot - never cries	never yells - always yells
	dislikes politics - likes politics (filler item)

Notes: ICS-T items are listed in the order presented on the measure. ICS-L items are listed next to their matching ICS-T item. *Fuzzy studies refers to social science and humanities courses.

Since crying behavior is not common and could be misinterpreted as an item dealing with weakness in the cadet population, this item was changed to "never yells - always yells." This item still addresses an affective component such as crying but relates better to the leadership and professional military construct being studied in this research. Positive and negative anchors were randomly assigned to the left and right side of the rating scale.

Peer Nominations

The third part of the self-report survey consisted of four questions (24-27) asking the cadets to nominate individuals they considered to be the best leaders in the squadron, the best leaders after graduation, the best examples of the Academy's core values of integrity, selflessness, and excellence, and the most respected. Space was provided to list up to three individuals in each category. The order of the four questions was changed at each time point.

Social Cognitive Map (SCM)

The remaining questions on the survey (28-31) consisted of questions pertaining to the social networks within the cadet squadron. Question 28 asked individuals to identify groups of individuals within the squadron "who hang out together." Cadets were provided space to identify up to 15 groups and additional paper was provided for cadets who wished to identify more than 15 groups (although no one requested additional paper at any of the survey administrations). Cadets were asked to identify groups by first and last name. If the cadet identified an individual from outside the squadron, they were asked to indicate that cadet's squadron affiliation. Question 29 asked cadets to identify the leaders within their own peer group and question 30 asked cadets to identify individuals within the squadron who do not hang out with a particular group. The final questions asked cadets to identify those cadets they consider to be their best friends at the Academy.

The SCM technique to identify social networks was developed by Cairns & Cairns (1994) for use with elementary and early junior high school students in the Carolina Longitudinal Study. The technique has been used in various groups including young elementary school children (Cairns & Cairns, 1994), special education populations (Farmer & Cairns, 1991), and college students at a women's college (Edwards, personal communication, January 10, 1997). Errors in reporting tend to be ones of omission (i.e., an individual does not identify a group which exists) and not ones of commission (i.e., identifying non-existent groups).

Identifying Social Networks

Identification of peer social networks was done using the SCM procedures developed by Cairns and associates (Cairns, Perrin, & Cairns, 1985; Cairns, Cairns, Neckerman, Gest, & Gariépy, 1988; Cairns, Gariépy, & Kinderman, 1990). The SCM procedure assumes that individuals are capable of identifying some or all of the existing social groups within an organization in response to the probe: "Are there people who hang around a lot? Who are they?" (Cairns et. al., 1990). The question can be asked in an interview or as part of a paper and pencil format. For this research, the question was included as part of the survey administered to cadets at all three time points.

Cadets were able to identify as many cadet groups as they could recall within the squadron. Cadets were not provided with a squadron roster or other external aids that listed squadron members. Cadets could nominate cadet groups consisting of only squadron members or groups of squadron members and outside the squadron members. Nominated groups were then analyzed using the SCM 4.0 computer program (Leung, 1998). The program utilizes an algorithm that identifies the individual within the organization with the

most overall nominations. The program then identifies the individual most frequently nominated in the same group with the highest nominated person, then the second most nominations, and so on until no remaining individuals are co-nominated with the most nominated person. The program then proceeds to the next highest nominated individual and continues through the groups until all groups have been identified. The program uses a correlation matrix during the iteration process to properly match the person to a peer group. If an individual is a better match with a later peer group they are either moved to that peer group or they are considered a dual-member of both groups, depending on the magnitude of the correlations in the correlation matrix. A cooccurrence matrix which has an individual's total number of nominations on the diagonal and the frequency of cooccurrence with all other organization members on the off-diagonal element is created after the program has finished making group matches. Individuals without a group affiliation are identified as isolates.

The correlation matrix is derived by intercorrelating the arrays of the cooccurrence matrix. The matrix gives an indication of the degree of similarity between two personal profiles within the sample (Xie, 1998). A decision on group membership is based on the magnitude of the correlation. If two group members have similar cooccurrence profiles, their correlation values will be high. A cut point of .40 has been established as a good point to determine group membership (Cairns, et. al, 1990). It is also possible that an individual could be a member of more than one peer group. In cases where a person is identified with more than one group, they are considered to have dual- or multi-group membership. Multi-membership is reported if an individual has a correlation of .40 or higher with more than half the group members of a second, third, etc. group.

Once social groups are identified, it is possible to determine the centrality of individuals and groups (Cairns, Leung, Buchanan, & Cairns, 1995). Group centrality is identified by a centrality index (CI) which is the average of the nominations received by the two highest persons within that group. The CI of highest ranking group in the network (CI_H) is computed and all groups with a CI of .70 X CI_H and higher are identified as high central groups. Groups with a CI of .30 X CI_H and lower are identified as low centrality groups. Remaining groups between the two extremes are defined as medium centrality groups.

Individual centrality is computed both within peer groups and within the overall organization. Within a peer group, centrality is computed based on the CI (average of the total nominations for the two highest individuals within a specific peer group in the entire social network) of the individual's peer group. Individuals are considered to have high centrality within their peer group if their frequency of nomination score is at or above .70 X CI of their group. Individuals have low centrality if their frequency of nomination score falls at or below .30 X CI of the group and medium centrality if their frequency of nomination score falls between these two extremes.

The overall centrality of an individual within the larger organization or social network is computed by combining information from both the group and individual centralities described above. An individual is considered to have nuclear network status if he is a high central member of a high central group. An individual has secondary network status if he is a high central member of a medium group or a medium central member of a high or a medium group. A low member of any group or any member of a low group is considered to have peripheral network status. A final category is isolate which identifies those cadets who are not nominated to be a member of a group.

SCM group stability can be computed by comparing group membership across measurement points. Criteria for group stability follows recommendations by Cairns, et. al. (1995). This criteria suggests that a group be considered stable if at least one half of the group members remain the same over measurement points. A stable group is identified as identical, if all group members remain the same over time (no additions or subtractions in group membership) or modified, if at least one addition or subtraction was made to group members but at least half the group members remain unchanged. An unstable group consists of a group which has less than half of its original members. A group is considered fragmented if less than half of the original members remain in the group but at least two original members are still present. A group is considered dissolved if no two persons from the original group remain in the group.

All nominations were analyzed using the SCM 4.0 program (Leung, 1998). Approximately one-third of the groups in each squadron at each time point were identified by only one nominator. These groups were primarily composed of self-nominated groups and over half were groups with one squadron member and one or more outside the squadron member. Although the existence of these groups is very likely, they cannot be confirmed without additional nominations. Two options available in the SCM program were utilized to produce a more parsimonious matrix.

The first option allows the computer to remove self-nominations to one's own peer group that are not corroborated by other members of the social network. For example, if a person nominates himself to be a member of a peer group but is not identified as a member of that group by any other member of the social network, then this option would remove that person as a member of the group. The second option allows the researcher to set a cut point

for the minimum number of nominations a person has to have with a group to be included in the group. The default is set to zero which allows an individual to be a member of a group with only one cooccurrence with another group member as long as the cooccurrence exceeds the cut-off reliability of .40. By setting the cut point to one, the computer only considers individuals who have received two or more nominations with the group that have reliabilities exceeding .40.

When no restrictions were placed on the groups, approximately one-third of all cadet groups in both squadrons at all three time points were peripheral groups consisting of single nomination members. Much of this portion of the social network was not confirmed by other members of the group and most of these groups consisted of a single squadron member with outside the squadron peers. When cadet self-nominations were removed from the groups, group structure and membership remained essentially unchanged. The number of groups remained stable when compared to the no restrictions social structure but some peripheral members were eliminated from groups. However, about one-third of the matrix remained single nomination groups. By setting a cut-score of at least two nominations to be considered a member of a group, a more parsimonious picture of the cadet network was obtained. Groups which had only one nomination for each group member were removed from the map and several peripheral members of existing groups were removed from the groups. For the remaining analysis, it was decided to use the cut-score of greater than one nomination required for group membership for several reasons.

At all three time points for both squadrons, the only individuals removed by using this method were either peripheral members of the social network or were dual members who lost their dual membership while retaining their membership with the more central group.

The only exception was one cadet in Squadron H at time 1 who was a secondary member of a secondary group in the original social cognitive map and was not in a group in the cut point cognitive map. Out of 117 groups consisting of 448 members across the three time points in both squadrons, only one of the secondary or higher members of the original, unrestricted cooccurrence matrices was not a secondary or higher member of the restricted matrices. Some cadets were moved to different groups with the cut point, but these cadets did not change in overall network centrality (i.e., if they were a secondary network member in the original SCM analysis, they remained a secondary member in the restricted analysis but were affiliated with a different peer group made up of some but not all of the original group members).

This thesis is interested in the influence of social networks on individual development and the social affiliations of nuclear and secondary network members is of prime concern. Since the cut-point of two or greater nominations did not significantly alter the affiliations of the nuclear and secondary members, the more parsimonious solution allowed for a clearer picture of central social structures within the squadron.

In order to distinguish between isolated cadets who did not receive any nominations and those cadets who received nominations but were not placed in a group because of the cut-point restriction, any cadet who was nominated to a group below the cut-off point but not affiliated with any one peer group was put in a new centrality status labeled 'marginal.' This allowed them to be considered separately from the peripheral and isolated members of the network. Table 2.4 shows a summary of the various centrality and stability indices.

Table 2.4: Summary of Group and Individual Status Designations

	Method of Computation	Centrality
Status of a Peer Group Within the Organization	Based on the centrality index of the highest nominated group within the social network (CI_H).	**High** $\geq .70 \times CI_H$ $.30 \times CI_H <$ **Medium** $< .70 \times CI_H$ **Low** $\leq .30 \times CI_H$
Centrality of an Individual Within a Peer Group	Based on the centrality index of the individual's peer group (CI).	**High** $\geq .70 \times CI$ $.30 \times CI <$ **Medium** $< .70 \times CI$ **Low** $\leq .30 \times CI$
Centrality of an Individual Within the Social Network (entire squadron)	Based on a composite of the individual's peer group centrality and the centrality of the individual within the peer group.	**Nuclear** = high member of a high group **Secondary** = medium member of a high group, high member of a medium group, or medium member of a medium group **Peripheral** = low member of any group or any member of a low group **Marginal** = received at least one overall nomination but did not pass cut-point criteria for group membership **Isolate** = no nominations
Group Stability	Computed by the percentage of members who remain in the same peer group over time.	**Stable** = 50% or greater of the group members are the same (**Identical** if all members are the same or **Modified** if group changed but $\geq$ 50% of the group remains unchanged.) **Unstable** = less than 50% of the group members are the same (**Fragmented** if less than 50% of the group remains the same but at least two members remain or **Dissolved** if the group has no remaining group members.)

Note: The centrality index (CI) is the average number of the nominations for the two highest nominated individuals within a peer group. CI_H is the CI of the highest nominated group within the entire social network.

To summarize, the SCM procedure is an efficient and robust procedure for the identification of peer groups, their membership, and the centrality of individuals and groups. Although the procedure provides considerable information about social structure and group affiliations, the assessment of network centrality is applicable to questions of individual development. Its psychometric properties are robust (see Cairns & Cairns, 1994) and it was readily adapted to the social structure of the squadrons at the Air Force Academy.

Measuring Similarity (Homophily) in Social Networks

To measure homophily in peer groups, the similarity of within-group-members is compared to the similarity of individuals across group membership. Intraclass correlations were used to identify the degree of similarity within the group compared to the similarity between groups (McNemar, 1962). Shavelson (1988) defines the intraclass correlation as the "proportion of variance in the dependent variable accounted for by the independent variable." (p. 363) For the peer groups identified using the SCM procedure, the intraclass correlation measures the proportion of variance of a given dependent variable (i.e., military performance average) accounted for by the differences within and between the groups. In other words, the larger the intraclass correlation, the greater the within group resemblance (homophily) in the sample (McNemar). The intraclass correlation was computed on several variables of cadet performance using the following formula given in McNemar (p. 185):

$$r' = \frac{S^2_b - S^2_w}{S^2_b + (m - 1)S^2_w} \qquad (2.1)$$

Where r' is the intraclass correlation, S^2_b is the mean square between groups, S^2_w is the mean square within groups, and m is the average group size. If the F associated with S^2_b/S^2_w is significant, then evidence exists for a significant r'. The intraclass correlation provides a measure of intra-group similarity given in a correlation metric (-1 to +1). Since a significant

F-value results when the S^2_b exceeds S^2_w, negative intraclass correlations are rare and only occur when S^2_b is less than S^2_w (the F-ratio is less than 1).

Survey Part II - Cadet Supervisor Ratings on the Interpersonal

In addition to self-reports on the ICS-L measure, supervisor ratings on cadets were also desired. In original ICS-based research, this rating is typically collected from teachers. For the Academy setting, ratings from peer leaders within the squadron were requested. Cadets in positions which placed them in a supervisory role over at least one other cadet were asked to stay after completion of the self-report survey to fill out surveys on their subordinates. Because peer leadership positions rotate at the beginning of each semester, the cadet raters were the same individuals for T_1 and T_2, but different for T_3. Participation rates for this part of the survey were comparable to the self-report rates. This part of the survey was identical to the ICS-L self-report measure. A cover letter with directions was attached to the ICS-L measure. A copy of the cover letter is located in Appendix B.

Factor analysis of the supervisor reports on the ICS-L scale followed the strategy described in Cairns, Leung, Gest, and Cairns (1995). (Factor analysis of the self-reported ICS-L scale from part I of the survey yielded an unstable and unclear factor structure and was not used in any subsequent data analysis.) The factor structure of supervisor reports on the ICS-L scale at each time point was very similar to the ICS-T factor structure reported by Cairns, et. al. Table 2.5 shows the factor structure of the original ICS-T and the ICS-L developed for this research. A complete description of the factor analysis strategy and the factor loading patterns obtained at each time point can be found in Appendix C.

Table 2.5: Comparison of the original ICS-T Factor Structure and the Supervisor Reported ICS-L Factor Structure.

Original ICS-T Measure (Carolina Longitudinal Study)			ICS-L Measure (U.S. Air Force Academy Study)		
popularity scale	aggression scale	academic scale	leadership scale	hostile aggression scale	academic scale
friends	gets in fights	good at math	friends	hostile	good in engineering
popular with girls	argues	good at spelling	popular	argues	
popular with boys	gets in trouble		leader	yells	
smiles			respected	not friendly	
good looking			smiles		
good at sports			athletic		

Note: All scales range from 1 to 7. On the original ICS measure, all scales were scored with 7 as being high on each factor and 1 being low. For the ICS-L, the academic and leadership scales were also scaled with 7 being high and 1 being low. Hostile aggression was reverse scored so a 7 corresponds to low levels of aggression and a 1 corresponds to high levels of aggression. This was done so that the high end of each scale represented a positive factor (i.e., a 7 on all three scales would indicate low levels of hostile aggression, high academic competence, and high leadership competence). Unless otherwise indicated, this scaling is used in all analyses in this research.

Official Record Data

Participating cadets gave permission on their informed consent forms to access their official record for demographic, performance, and background information. Variables obtained from official records and used in data analysis are listed in Appendix D. Official record variables were obtained in coordination with the Air Force Academy's Office of Institutional Research. Cadet names and social security numbers were supplied by the Office of Institutional Research to aid in the accurate coding of the data. Otherwise, cadet names and identifying information were masked in all data analysis.

Person-Centered (Cluster) Analysis

Cluster analysis assumes that while each individual is unique, the majority of individuals can be classified into a smaller number of clusters on a limited number of key variables. These clusters represent most of the typical configurations of individuals in the population. Cluster analysis was done using the Sleipner 2.0 program (Bergman & El-Khouri, 1998). Ward's method using squared Euclidean distance as the dissimilarity measure to determine cluster membership was used. As clusters are consolidated, the criterion determining cluster make-up is to combine the two clusters giving the smallest increase in the total error sum of squares of the cluster solution. For each cluster, a homogeneity coefficient is reported which "is the average within-cluster average squared distance of the cluster" (Bergman & El-Khouri, p. 34). In addition, an explained error sums of squares (ESS) is computed for the cluster solution by the following equation:

$$ESS = \frac{100 \text{ x (total error sum of squares - error sum of squares of the given cluster solution)}}{\text{total error sum of squares}} \qquad (2.2)$$

For a cluster solution with only one cluster, the ESS would be zero and when the number of clusters equals the number of participants, ESS equals 100. The decision on the number of clusters to use in the solution is a combination of theoretical considerations and the magnitude of change in the ESS from one solution to the next. Examining changes in the magnitude of the ESS using a scree plot is one way to determine when the ESS has reached a point of best fit.

Two modules in the Sleipner 2.0 program allow for the relocation of poorly fitting members from one cluster to another and the removal of individuals who are outliers in the final cluster solution. The relocate procedure moves cases from one cluster to another if that movement results in a reduction in the total sum of squares in the overall cluster solution resulting in more homogeneous clusters. Outliers are identified by a residue procedure which uses the average squared Euclidean distance as a dissimilarity measure. If the squared Euclidean distance is greater than 0.5, the case is pruned from the overall sample.

Procedure

Research was coordinated with the Office of Institutional Research, United States Air Force Academy, Colorado. In addition to the Institutional Review Board (IRB) procedure common to social science research, research with the cadets at the Air Force Academy required coordination with several staff agencies and approval from the Superintendent of Cadets. Once approved, any major changes to the design and conduct of the study required further approval for the revisions. Although minor changes in the survey were made, the research remained in the essential form originally approved by the Superintendent. The Office of Institutional Research selected the two squadrons for the study and aided in a portion of the data collecting and coding.

Instructions for completing the survey were placed on an overhead projector for cadets to read as they entered the survey location. The investigator (GP) administered the survey along with representatives from the Office of Institutional Research and the Behavioral Sciences and Leadership Department at the Air Force Academy. At all three time points, cadets unable to attend the group survey administration were sent surveys in the cadet mail distribution system with an instruction sheet and return envelope. Copies of the instructions given to cadets for the group and for the mailed surveys are in Appendix E. Instructions were the same at each time point.

Coordination to meet with cadets in the squadrons was done directly with the squadrons. At the first data collection point, the cadets in both squadrons were scheduled to attend a group survey administration during the morning common examination period on the cadet schedule. A day was selected with minimum conflicts with academic examinations and coordinated with the Cadet Wing Scheduling Office. Due to last minute changes in the cadet schedule, the survey period was lost from the master schedule and cadets did not get notified of the survey time. Because a different block of time to administer the surveys to both squadrons simultaneously was not available in the cadet master schedule, time one surveys were administered separately to the two squadrons. One squadron completed surveys during a military training period following lunch. The other squadron completed their survey during the next morning's common examination period. Both administrations occurred in a large lecture hall in the cadet academic building.

At time two, the investigator (GP) was unable to travel to the Academy to administer the surveys, so group surveys were administered by the same representatives from the Office of Institutional Research and the Behavioral Sciences and Leadership Department who assisted

with the survey administration at time point one. The survey was administered to both squadrons at the same time in a lecture hall in the academic building during the morning examination period. At time three, it proved difficult to coordinate a time for both squadrons to complete their surveys together. Therefore, squadron A completed their surveys in two classrooms in the academic building during the military training period after lunch. Squadron H completed their surveys in the dormitory in the evening. Both survey administrations at time three were supervised by the investigator (GP).

After data were collected at each time point, cadets were assigned random code numbers and all personal information (the name of the respondent, as well as, any names the respondent wrote on the survey form) was recoded with the code numbers to protect the privacy of the individuals named on the surveys. Cadets were assured on several occasions that the data they provided would not become a part of their official records nor would it be disclosed to anyone beyond the research project.

Chapter 3
Identification, Propinquity, and Homophily in Peer Social Networks

The goal of this chapter is to identify and analyze the stability, fluidity, and continuity of peer social structures within each squadron over the school year. Since the primary thesis proposed in this study is that leadership develops in and through social contexts, especially immediate social contexts with peers, an understanding of the social world of cadets is important in understanding cadet leadership development.

SCM procedures were used to address three hypotheses concerning the identification and description of the social networks at the Academy. First, it was hypothesized that cadets will form groups based primarily on propinquity (most groups will be within the squadron with few groups extending outside the squadron) and homophily (cadets will be similar to other group members in terms of performance and ability). Second, it was hypothesized that cadets will affiliate primarily with cadets in their class, with the strength of this affiliation declining over the four years at the Academy. In other words, senior cadets will be more likely to affiliate with cadets outside their class than freshman cadets. Finally, it was hypothesized that networks which extend outside the squadron boundary would be comprised of cadets involved in wing-wide activities (i.e., intercollegiate athletics, wing staff, etc.).

Description of the Social Networks

Table 3.1 shows the average peer group size for the SCM analysis at each time point. The more central the group, the larger the group ($F(2, 114) = 26.43$, $p < .001$). All groups differed significantly (Tukey HSD, $p < .01$) with highly central groups being the largest,

medium central groups being the next largest, and low central groups being the smallest. Table 3.2 shows the network centrality of peer groups for both squadrons by class year. Central status groups were defined as the combination of high and medium central groups. Non-central status groups were defined as the combination of low central groups, marginal cadets, and isolate cadets. As predicted, at the beginning of the school year sophomores and seniors were more likely to be members of high central while freshman and juniors were more likely to be members of non-central groups. As the school year progressed, junior and freshman cadets were able to become more central in the social network so that by the end of the school year, there were no differences in centrality based on class year. However, within the central group status, all the freshman cadets were in medium groups and were never mentioned in highly central groups at any time point.

Propinquity

A person's environmental context (physical, social, and cultural) has an important effect on an individual's pattern of social interactions (Neckerman, 1992). Since cadets primarily work and socialize within their squadron, the squadron was expected to be the source for most, if not all, social relationships among cadets. Freshman cadets have even fewer opportunities to socialize outside the squadron because they are not allowed to socialize with cadets in other squadrons except when on a pass, on the athletic fields, in the cadet recreation center (Arnold Hall), or in academic and official military settings. While these observations are generally accepted by cadets at the Academy, SCM procedures allow for the quantifying of the influence squadron membership has on social interactions.

Table 3.1: Average Group Size by Group Centrality for Both Squadrons at Each Time Point.

	Time 1 Aug. 97	Time 2 Nov. 97	Time 3 Apr. 98	Mean
High Centrality Groups				
Average Group Size	5.4	5.0	5.1	5.2
Number of Groups	8	6	7	7
Medium Centrality Groups				
Average Group Size	4.0	4.0	4.5	4.1
Number of Groups	15	22	15	17.3
Low Centrality Groups				
Average Group Size	2.6	2.8	3.0	2.8
Number of Groups	14	13	17	14.6
Total of All Groups				
Average Group Size	3.8	3.8	4.0	3.9
Number of Groups	37	41	39	39
Number of Marginal Cadets	101	85	88	91
Number of Isolates	34	33	32	33
Number (%) cadets providing nominations	96/209 (46%)	93/209 (44%)	93/204 (46%)	

Notes: A total of 26 cadets in both squadrons were dual members (6 at time 1, 10 at time 2, and 10 at time 3). Except for isolates who are only squadron members, totals of all groups and marginal cadets include cadets who are squadron members and cadets nominated to cadet groups but are not in the squadron. Squadron strength at T_3 is lower reflecting cadets who left the Academy between T_2 and T_3.

Table 3.2: Group Centrality for Both Squadrons by Class Year and Time of Measurement

	Senior	Junior	Sophomore	Freshman	Total
Time 1 (Aug. 1997)					
Central Groups	33 (.69)	17 (.30)	33 (.63)	13 (.25)	96
Non-central Groups	15 (.31)	40 (.70)	19 (.37)	38 (.75)	112
Total	48	57	52	51	208
Time 2 (Nov. 1997)					
Central Groups	28 (.58)	23 (.40)	32 (.60)	26 (.51)	109
Non-central Groups	20 (.42)	34 (.60)	20 (.38)	25 (.49)	99
Total	48	37	52	51	208
Time (Apr. 1998)					
Central Groups	25 (.52)	24 (.42)	24 (.59)	22 (.46)	95
Non-central Groups	23 (.48)	33 (.58)	25 (.51)	27 (.54)	108
Total	48	57	49	49	203

Notes: Central groups are the high central and medium central groups identified in the SCM analysis. Non-central groups are the low centrality groups, marginal network members, and isolates. Squadron A had 110 cadets at the beginning of the study but one cadet did not give full class information so he was removed for this analysis. Cadets in dual membership status were only counted in their highest centrality group. Squadron strength at T_3 is lower reflecting cadets who left the Academy between T_2 and T_3.

Time 1: χ^2 (3) = 31.01, $p < .001$
Time 2: χ^2 (3) = 5.78, $p = .123$
Time 3: χ^2 (3) = 1.21, $p = .751$

To test the hypothesis that cadets hang out primarily with cadets in their squadron, two approaches to propinquity were examined. First, the number of groups containing cadets outside the squadron was compared to the number of groups containing only squadron members. These findings are shown in Table 3.3. A second way to address propinquity is in terms of the centrality of outside the squadron members in the overall social network. These findings are reported in Table 3.4. As the tables show, cadets primarily identify peer groups which consist of other cadets from within the squadron. Although quite a few cadets from outside the squadron received at least one nomination at each time point (168 total nominations for outside the squadron cadets at all three time points combined), all but twelve of these cadets had a marginal status in the overall network. Of these twelve outside-the-squadron members, nine (5%) were peripheral members of the network and only 3 (1.8%) were secondary members. There were no nuclear members from outside the squadron.

These results suggest that a significant portion of the social structure relies on within-squadron cadets for group membership. Cadets do have relationships outside the squadron as evidenced by the large number (168) of cadets identified with the SCM procedure from outside the squadron across the time points. However, the fact that only three outside the squadron members, out of a total of 168 nominations for both squadrons, were identified as secondary and no cadet from outside the squadron was a nuclear member of the network suggests that for these two squadrons, outside the squadron cadets do not play a significant role in identifiable groups within the squadron.

Table 3.3: Number (Percentage) of SCM Groups with Only Squadron Members Compared to the Groups with at least One Outside the Squadron Member.

	Aug. 97	Nov. 97	Apr. 98
Number of groups with only squadron members	31 (84%)	39 (95%)	35 (90%)
Number of groups with at least one outside the squadron member	6 (16%)	2 (5%)	4 (10%)
Total number of groups identified	37	41	39

Table 3.4: Number of Cadets from Outside the Squadron who were Nuclear, Secondary, and Peripheral Members of the Overall Social Network.

	Aug. 97	Nov. 97	Apr. 98
Nuclear members from outside the squadron	0	0	0
Secondary members from outside the squadron	2	0	1
Peripheral members from outside the squadron	4	2	3
marginal members from outside the squadron	52	48	56

Although cadets do have identifiable relationships with cadets outside the squadron, other squadron members primarily identify their squadron-mates as being members of groups primarily composed of cadets within the squadron. Since the primary source of leadership training and instruction occurs within the squadron setting, this finding provides support for the hypothesis that this training occurs primarily within the context of peer groups consisting of other squadron members.

Homophily

The question of homophily asks if these groups are similar in terms of interests and abilities. Intraclass correlations were computed for each squadron separately and for both squadrons combined at all three time points. In order to be considered for the analysis, the cadet group had to have at least two members with complete data on the variable being used. Therefore the number of groups and participants for each variable used differed depending on the number of cadets within each group at each time point who had valid data for the analysis. Intraclass correlations were computed on a total of thirteen variables from four different categories. Complete results of this analysis are located in Appendix F. Three of the findings were significant and will be discussed here.

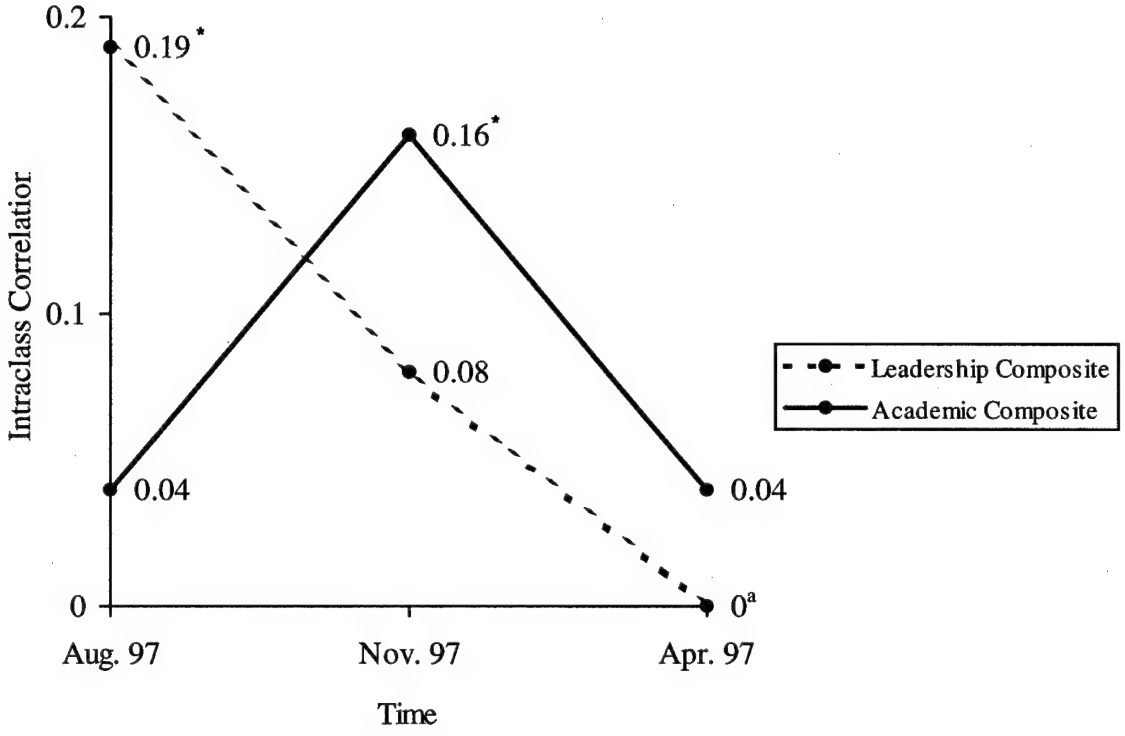
Homophily of Pre-Entry Measures

Several variables in the cadet official records provide information on cadet aptitude and experiences prior to their entry in to their squadron. Two of the measures are composite indices which are considered to be predictors of cadet success at the Academy. The Academic Composite Index (ACI) is based on equations combining ACT or SAT scores with the high school graduating rank (adjusted for class size and advanced courses). The ACI is considered a good predictor of overall GPA. The Leadership Composite Index is a

combination of athletic (based on participation in high school athletics) and non-athletic (based on leadership positions held in high school) measures. It is used as a predictor of overall leadership potential. Acceptance in a peer group is a joint function of the individual's desire to join a group and the group's willingness to accept the individual (Cairns & Cairns, 1994). It was predicted that these pre-entry performance indices could serve as a measure of initial group attraction. Peer groups were expected to be similar on these measures.

Data for this analysis were combined across squadrons because the squadrons showed similar patterns across the school year. Figure 3.1 shows that while there is a slightly positive correlation among group members on these indices during the fall semester, the intraclass correlation was close to zero by the end of the school year. (This same pattern was found in other pre-entry variables, see Appendix F). Prior experiences have a small, but significant intraclass correlation during at least one measurement point in the fall semester. However, it becomes negligible by the end of the year. It is possible that class differences might exist. For example, freshman might be more likely to be similar on pre-entry variables than the upper three classes. Unfortunately, there were not enough peer groups from each class to test this hypothesis with the current data.

Figure 3.1: Intraclass Correlations for the Leadership Composite Index and Academic Composite Index at Each Time Point Combined Across Squadrons.



[a]Leadership Composite at T_3 was -0.01 and it was rounded to zero. A negative intraclass correlation indicates the between group variance is greater than the within group variance ($F < 1$).

*$p < .05$.

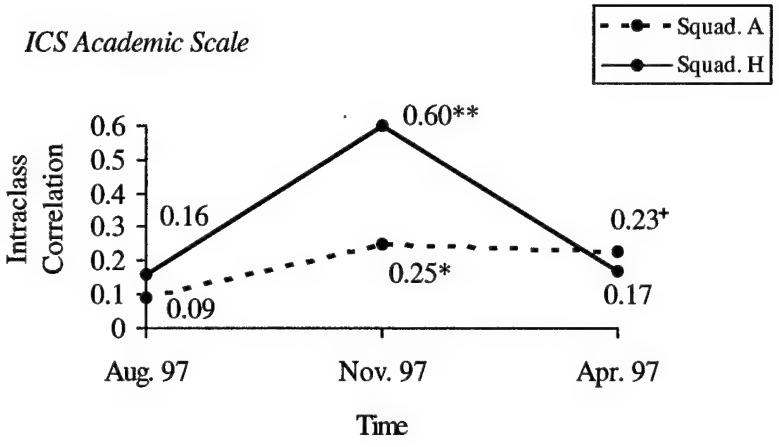
Homophily of ICS Measures

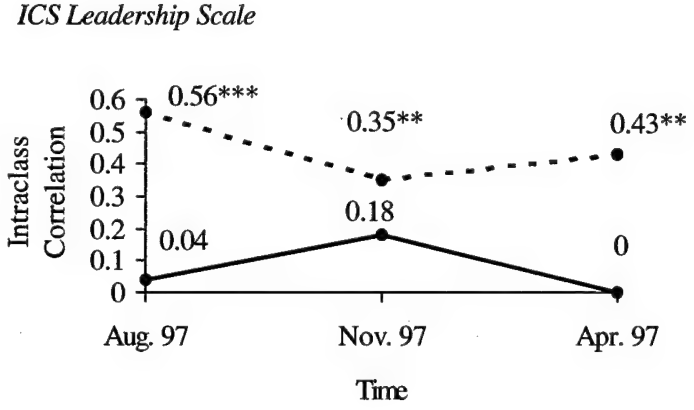
Analysis of the ICS measures yielded different results. It was expected that cadet groups would show significant intraclass correlations on the three ICS scales. Since there were squadron differences in intraclass correlations on the three ICS scales, these results are reported separately for each squadron in Figure 3.2. The results for the ICS scales suggest that in squadron H there is less variance accounted for by peer group membership than in the lower performing squadron on the ICS hostile aggression and leadership scales. The differences between the squadrons did not show a consistent pattern on the academic scale. With the exception of the academic factor at time point two, squadron H had low and nonsignificant intraclass correlations for all the ICS-L factors at all the time points. Squadron A, on the other hand, had significant intraclass correlations at all time points except the academic scale at time one. This suggests that for the supervisor ratings on individual competence, the cadets in squadron H were more homogeneous across groups whereas cadets in squadron A were more homogeneous within peer groups.

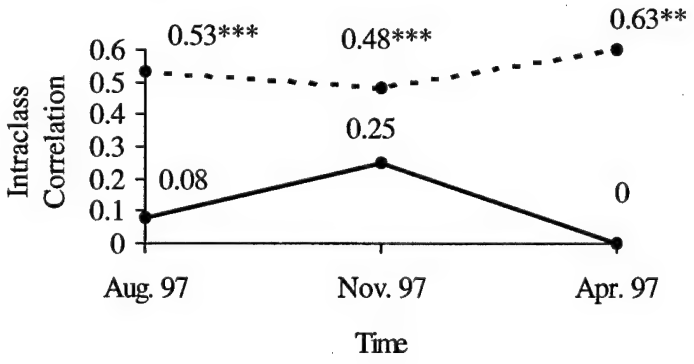
Homophily of Cumulative Performance Averages

The last three variables were the cumulative performance averages at the end of the school year (May 1998). In addition to a cumulative grade point average (GPA) and military performance average (MPA), a cumulative physical education average (PEA) based on fitness testing and physical education class grading was available. Since these cumulative averages were computed at the end of the school year, intraclass correlations for SCM groups at time three were used in this analysis. The results of this analysis are shown in Figure 3.3.

Figure 3.2: Intraclass Correlations for the ICS Academic, Leadership and Hostile Aggression Scales at Each Time Point For Each Squadron.



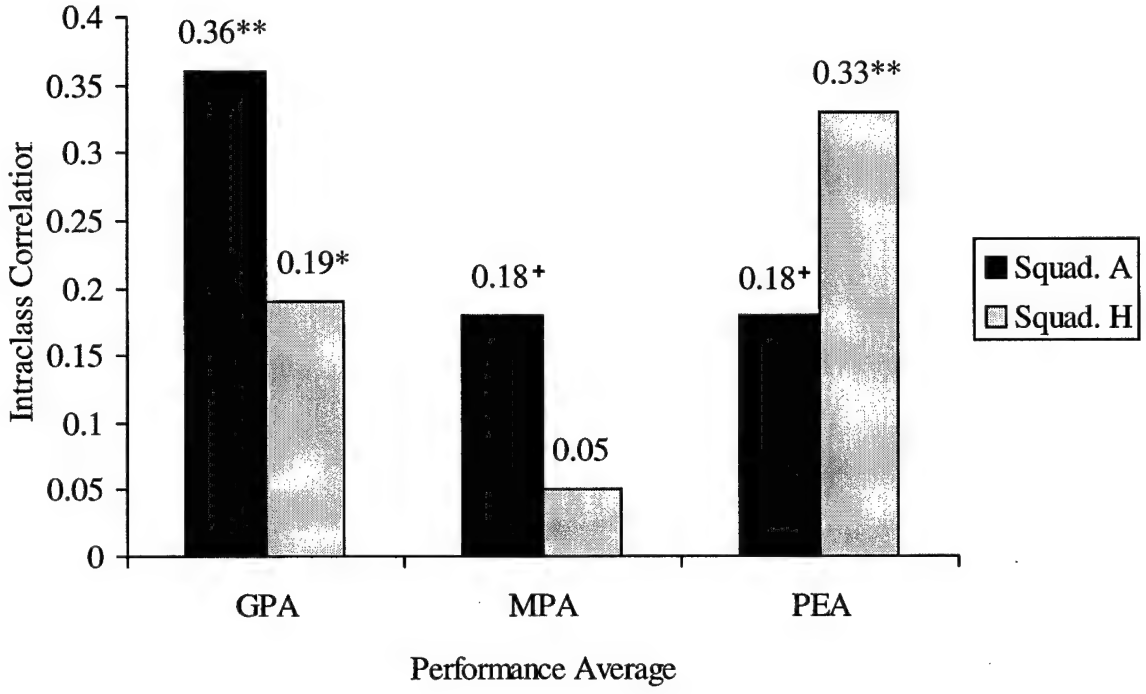




Notes: Leadership scale at T_3 was -0.09 and aggression scale at T_3 was -0.08. Both were rounded to zero. A negative intraclass correlation indicates the between group variance is greater than the within group variance ($F < 1$).

$^{***}p < .001$. $^{**}p < .01$.
$^{*}p < .05$. $^{+}p < .10$.

Figure 3.3: Intraclass Correlations for Cumulative Performance Averages Using April 1998 SCM Groups and End of the School Year (May 1998) MPA, GPA, and PEA.



**p < .01. *p < .05. +p < .10.

With the exception of PEA, squadron A continued to have higher intraclass correlations than squadron H. However, the magnitude of these intraclass correlations is not as high as the ICS scales. When only end of the school year intraclass correlations are considered, all of the ICS scales and performance averages for squadron A are significant while only the cumulative GPA and PEA are significant for squadron H.

In summary, the findings on homophily in peer groups in these two squadrons support the original hypothesis that cadet peer groups are similar, although some refinement to the original hypothesis is in order. For entering measures of leadership and academic ability, the within group similarity is quite modest and shows a decline as a function of the time spent in the squadron over the school year. This suggests that as the school year progresses, pre-entry conditions that initially draw cadets toward particular peer groups may be shifting to the background and contemporaneous factors such as leadership, aggression, and squadron performance may be coming to the forefront. This is especially evident in squadron A which had moderate to high intraclass correlations on contemporaneous supervisor ratings based on the ICS and on Academy reported performance averages.

Group Affiliations

In addition to propinquity with other squadron members, it was hypothesized that cadets would affiliate primarily with cadets in their class, with the strength of this affiliation declining over the four years at the Academy. Second, it was hypothesized that networks which extend outside the squadron boundary will be comprised of cadets involved in wing-wide activities (i.e., intercollegiate athletics, Wing or Group staffs, debate team, etc.).

Table 3.5 shows the number of cadets in single class and multiple class groups at each time point. Cadets of all classes are more likely to affiliate with members of their own class

than cadets of other classes. The only noticeable trend in the data is that freshman are less likely to affiliate outside their class than the other three classes. This more than likely reflects the restrictions placed on freshman during their first year. Fraternization rules do not allow upperclass cadets to affiliate socially with freshman cadets until about mid-way through the spring semester. These results suggest that fraternization is not a common phenomena in these squadrons. Even if a few groups do exist between freshman and upperclass cadets, they are probably not widely known or group members would risk punishment under the fraternization rule.

At the group level, Squadron H had fewer cadets in multi-class groups and fewer multi-class groups. Over the three time points, a total of 51 groups were identified in squadron H. Of these, only two groups (4%) were multi-class groups. There were no freshman or sophomores identified as being in multi-class groups in squadron H. In squadron A, eleven of 63 groups across all time points (17%) were multi-class groups. With the exception of one group at T_2 in squadron A composed of three classes (seniors, juniors, and a sophomore), groups with cadets from more than one class were comprised of members from adjacent classes (i.e., juniors and seniors). The Academy encourages cadets to keep social distance between classes not only to minimize fraternization but also to encourage appropriate use of the chain of command. Both squadrons had clear distinctions between the classes, however, squadron H showed a trend toward keeping greater class distances.

Table 3.5: Number of Cadets in Peer Groups with Cadets of the Same Class and Cadets From Other Classes.

	Senior	Junior	Sophomore	Freshman	Total
Time 1 (Aug. 1997), Number of cadets in:					
Single Class Groups	32	24	31	39	126
Multi-Class Groups	7	3	4	0	14
Total	39	27	35	39	140
Time 2 (Nov. 1997), Number of cadets in:					
Single Class Groups	29	31	38	31	129
Multi-Class Groups	9	6	5	0	20
Total	38	37	43	31	149
Time 3 (Apr. 1998), Number of cadets in:					
Single Class Groups	36	29	16	38	119
Multi-Class Groups	6	8	6	2	22
Total	42	37	22	40	141

Note: Since outside the squadron members did not have class affiliations, they were not considered in this table. Dual members were counted for both groups. Participants were excluded if other group members were only from outside the squadron since class year of those members was not available.

Outside Squadron Activities and Group Membership

The last issue of group affiliation is the question of are cadets who hang out with cadets outside the squadron more likely to be involved with outside the squadron activities? Intercollegiate athletics, group and wing staff members, and cadets involved in other Academy-wide activities spend as much or more time with their teams or staffs than with other squadron members. Junior cadets might also be more likely to maintain social ties with cadets in their prior squadron, although this trend should lessen over the school year.

For this analysis, the original, unrestricted SCM output was used to identify cadets who had peer group affiliations with other cadets outside the squadron. This was done because many cadet groups with outside the squadron members may only be identifiable by the cadet in the group. Eliminating groups using the cut point of one for a requirement for group membership would eliminate the majority of the outside the squadron groups. A cadet was considered to be in a peer group with outside the squadron members if she was nominated to one or more peer groups with another cadet from outside the squadron. In the cases of multi-group membership, a cadet was considered as being affiliated with a group containing outside the group members if at least one of her groups contained members from outside the squadron. Single nominations and self-nominations were included in the analysis.

After identifying the cadets who had nominations with groups with at least one cadet from outside the squadron, the number of cadets in intercollegiate, wing staff, and group staff activities were compared to the number of cadets in these activities who were only affiliated with peer groups consisting of squadron members. Cadets involved in activities outside the squadron were identified by combining data from three sources: cadets on group or wing

staff as identified in official Academy records at the time the SCM group data were collected; recruited athletes; and cadets who self-reported they were involved in an outside the squadron activity on the survey at time 1. A chi-square test with membership in a group with outside the squadron members as the column variable and participant in activities outside the squadron as the row variable was run at each time point. At all three time points, the chi-square was nonsignificant suggesting that cadets in groups with outside the squadron members are not more likely to participate in outside the squadron activities.

These results do not support the original hypothesis that cadets in outside activities would be more likely to be identified with peer groups consisting of other cadets from outside the squadron. This does not mean that these cadets may not have more affiliations outside the squadron than other cadets. However, if these outside the squadron affiliations are present, they do not appear to be readily identifiable by other cadets within the squadron. One possible explanation for this would be that cadets involved in outside the squadron activities would be less visible in the squadron and would be more likely to be in peripheral, marginal, or isolate status in the network. However, chi-square tests at all three time points do not show significant differences for participation in outside the squadron activities and social network centrality. Therefore, cadets involved in activities outside the squadron seem to be just as likely to be members of peer groups exclusively made up of squadron members as members of peer groups of both squadron and non-squadron members. The results of all chi-square tests of participation in outside activities and network status or group membership are located in appendix G.

One final hypothesis concerning affiliations with outside the squadron cadets is that members of the junior class would be more likely to affiliate with cadets from outside the

squadron and that this affiliation would decrease as the semester progressed. To test this hypothesis, a contingency table of class year by group composition (only squadron members versus combined squadron and outside the squadron members) was analyzed by a chi-square test (Table 3.6).

The results in Table 3.6 were combined across squadrons since both squadrons showed similar patterns of peer group membership. The results indicate that at all time points, cadets in all four classes had higher percentages of cadets in groups made up of only squadron members than in groups made up of both squadron and outside the squadron members. As predicted, junior class members had higher affiliations with cadets from outside the squadron than the other classes at all the time points with the exception of the senior cadets at time point three. The proportion of junior cadets affiliated with groups containing outside the squadron members did decrease over the academic year (.44 at T_1 to .20 at T_2 and .22 at T_3). At the same time, the number of cadets in the other classes who began affiliating with cadets from outside the squadron increased. Therefore, by the end of the school year, there were small class differences in affiliations with groups containing outside the squadron members. Thus, the new junior cadets appeared to be making stronger connections to their new squadron mates as the school year progressed. In addition, the remaining squadron members seemed to be expanding some of their social affiliations to other cadets outside the squadron.

Table 3.6: Affiliations with Peer Groups with Cadets from outside the Squadron at all Time Points

	Fresh-man	Sopho-more	Junior	Senior	Total
Time 1 - August 1997					
Number of cadets in groups with only squadron members	26 (.96)	31 (.94)	13 (.56)	20 (.65)	90
Number of cadets in groups with outside the squadron members	1 (.04)	2 (.06)	10 (.44)	11 (.35)	24
Total	27	33	23	31	114
Time 2 - November 1997					
Number of cadets in groups with only squadron members	29 (1.00)	35 (1.00)	28 (.80)	29 (.97)	121
Number of cadets in groups with outside the squadron members	0 (.00)	0 (.00)	7 (.20)	1 (.03)	8
Total	29	35	35	30	129
Time 3 - April 1998					
Number of cadets in groups with only squadron members	31 (.86)	25 (.89)	25 (.78)	20 (.65)	101
Number of cadets in groups with outside the squadron members	5 (.14)	3 (.11)	7 (.22)	11 (.35)	26
Total	36	28	32	31	127

Notes: At least one third of the group needed to be from outside the squadron to qualify as a group with outside the squadron members.

Time 1: χ^2 (3) = 20.20, $p < .001$
Time 2: χ^2 (3) = 16.11, $p = .001$
Time 3: χ^2 (3) = 6.93, $p = .074$

Chapter Summary

Overall, the analyses in this chapter have shown that cadets do form identifiable peer groups and that these peer groups seem to provide a context for development. These groups showed an increase in size as groups became more central. Juniors and freshman were not members of central groups early in the school year but were equally central by the end of the school year. Freshman, however, were not ever identified in peer groups with higher than medium centrality in the squadron social networks. The hypothesis that cadets would form groups based primarily on propinquity (most groups will be within the squadron with few groups extending outside the squadron) was clearly supported. A significant majority of the peer groups were composed of squadron members. Those outside the squadron members who were identified with other cadets in the squadron tended to be on the margins of the social network in the squadron.

Homophily was found to be a factor in peer groups in both squadrons. However, the overall effect was not strong and the types of similarities varied depending on squadron membership. The magnitude of these effects varied across the squadrons, especially for the ICS leadership and hostile aggression scales. On these two scales, squadron A had very high intraclass correlations while the intraclass correlations in squadron H were low and nonsignificant. In general, squadron A had higher homophily on almost all variables. Homophily on pre-entry indices for leadership and academic potential was marginally significant during the fall semester but declined toward zero by the end of the school year suggesting that these pre-entry factors may be playing a small role in initial group formation. Contemporaneous factors in the squadron, however, appear to become more salient as the school year progresses.

The hypothesis that cadets will affiliate primarily with cadets in their own class and that the strength of this affiliation will decline over the four years at the Academy was also supported. Most cadets did affiliate primarily with their class and the upper three classes were more likely to have peer groups extending across class boundaries than the freshman class. There was a trend for the higher performing squadron to have fewer multi-class peer groups but this trend was not tested empirically due to the small number of groups in each class.

Finally, it was hypothesized that networks extending outside the squadron boundary would be comprised of cadets involved in wing-wide activities (i.e., intercollegiate athletics, Wing or Group staffs, debate team, etc.). This hypothesis was not supported by the SCM data. Cadets in peer groups with outside the squadron members were not more likely to be involved in activities involving significant time spent outside the squadron. This does not mean intercollegiate athletes and other cadets involved in outside the squadron activities did not have important social networks outside of the squadron boundaries. It seems more likely that these outside the squadron peer groups do not overlap with the peer networks within the squadron. In addition, junior cadets seemed to be increasing their ties with their squadron mates over the school year and the other three classes showed a trend toward expanding their peer networks to cadets outside the squadron. However, at all times, there were more cadets affiliated with peer groups of squadron members only, than there were cadets affiliated with mixed groups of squadron members and outside the squadron members.

Chapter 4
Peer Group Stability, Individual Stability, and Leadership

This chapter examines the stability of the social networks and the differences between formal and informal leaders.

Stabilities and Changes in Peer Networks

Continuities in social environments over time are an important aspect of understanding individual continuities over time. Although names and faces may change in peer groups across time, continuities in peer social characteristics can promote individual continuity in behavior (Neckerman, 1992, 1996).

Analysis of the stability of social networks over the school year addressed three hypotheses. First, it was hypothesized that cadet peer groups would be stable over the school year and cadets who change network affiliations would be likely to join new peer groups with similar characteristics (similar group behaviors and characteristics, as well as, similar centrality of the group and individual group members). Second, it was expected that most changes in peer groups over the school year would occur in the freshman and junior class since they had only been together since June (freshman) or August (junior). Sophomores and seniors who have been together for one full year prior to the study would be expected to show higher stability in peer networks over the school year. Finally, it was expected that individual network centrality would remain relatively stable over the school year. Individuals with high network centrality at the beginning of the semester will be likely to have high network centrality at the end of the school year.

First, the stabilities of the identified peer groups from T_1 to T_2, T_1 to T_3, and T_2 to T_3 were computed for each squadron. Table 4.1 shows the stability of the social groups across the school year. The data were combined across the two squadrons because both squadrons had similar patterns of stability. The peer groups used in the analysis were groups of three or more members. (Separate analysis with dyads included was also completed with similar results. Complete tables broken down by squadron, with and without dyads, are located in Appendix H.) As predicted, the peer groups were stable, with an average 77% of the peer groups retaining at least one half of their members between any two time points.

The next analysis looked at the stability of peer influence by computing Pearson correlations on the characteristics of the individual's peer group from T_1 to T_3. To remove the influence of the individual from the analysis, the group's mean score on a given variable without the individual's score on that dimension was computed for each individual in the group. Cadets were included in the analysis if they were identified as nuclear, secondary, or peripheral members of the social network at both time points and had scores available on the variables used in the analysis at both time points. The group average without the individual included was computed and this average was used for the correlations. Table 4.2 shows the results of the analysis and the list of the variables used. These results suggest that peer group influences are stable. The low correlation for MPA was not in line with these results and warranted further examination.

Table 4.1: Percent of Stable and Unstable Peer Groups over the Academic Year (No Dyads).

	Aug. 97 to Nov. 97	Aug. 97 to Apr. 98	Nov. 97 to Apr. 98	Total
Identical	30% (8/27)	26% (7/27)	40% (14/35)	33% (29/89)
Modified	44% (12/27)	48% (13/27)	40% (14/35)	44% (39/89)
Total Stable	74% (20/27)	74% (20/27)	80% (28/35)	77% (68/89)
Fragmented	11% (3/27)	11% (3/27)	6% (2/35)	9% (8/89)
Dissolved	15% (4/27)	15% (4/27)	14% (5/35)	15% (13/89)
Total Unstable	26% (7/27)	26% (7/27)	20% (7/35)	24% (21/89)

Note: Totals not equaling 100% are due to rounding.

Table 4.2: Stability in Peer Group Characteristics Over the Academic School Year Measured by the Pearson Product Moment Correlation between Group Measurement at T_1 and T_3 without the Individual's Score Included.

	r	valid n
Academic Composite Index	.92***	48
Leadership Composite Index	.79***	48
Current MPA	.12[a]	36
Current GPA	.85***	36
ICS-L - Academics	.64**	24
ICS-L - Hostile Aggression	.77***	24
ICS-L- Leadership	.98***	24

Note: Freshman were not included in the MPA and GPA computations because they did not have a GPA or MPA at the beginning of the study.

[a]One group of three juniors had very low MPA's at the beginning of the year and significantly higher MPA's at the end of the year. When this group was removed, the MPA correlation increased to .33 ($p = .06$) which was similar to the correlation for the entire sample ($r = .32$).

**$p < .01$, ***$p < .001$

Because of the small n's in the analysis, these correlations are easily affected by the existence of a few outliers. When the data were examined for the MPA, one group of juniors was found that entered the squadron with low MPA's and finished the school year with significantly improved MPA's. When these three cadets were removed, the MPA correlation increased to $r = .33$ ($n = 33$, $p = .06$) which was very close to the correlation for the entire sample not including the freshman who did not have T_1 MPA's ($r = .32$, $n = 131$, $p < .001$).

Further examination of the group of three junior cadets revealed an interesting pattern of performance over the school year. The group was an intact group from T_1 to T_3 and was secondary in the social network at both time points. Two members were nuclear members of the group at both time points and one cadet was secondary at both time points. The secondary member was average in terms of MPA and GPA at both time points. Both nuclear members were on conduct/aptitude probation for unknown reasons at the beginning of the school year and both were on multiple honors lists at the end of the school year. One of the nuclear cadets was on the Dean's and the Athletic Honors lists, the other was on the Dean's and the Commandant's Honors lists. The MPA's of the two cadets went from 1.50 for both at the beginning of the school year to 2.75 and 3.50 at the end of the semester. The 1.50 MPA indicates that these two cadet probably were involved in some major infraction of the regulations rather than consistent poor performers. A cadet with a major regulation violation (e.g., underage drinking) is automatically placed on probation and receives a 1.50 MPA, which is below the 2.0 MPA cut-point for placing a cadet on probation for sustained poor performance. The cumulative MPA's of these two cadets were 2.7 and 2.6 indicating that their performance was not typically below standards.

The two cadets who started the semester on probation had fall GPA's of 3.94 and 3.66 and spring GPA's of 3.88 and 3.65. The secondary cadet improved from a fall GPA of 2.46 to a spring GPA of 2.86 and was the academic noncommissioned officer for the squadron in the spring semester. These GPA's are very high and, when combined with the cadets' cumulative MPA give a picture of two cadets who got in to trouble and got back on track again. Even though their MPA correlation from the beginning of the school year to the end of the study was lowering the MPA correlation for the sample, the group actually demonstrates that stable peer group influences can have positive effects in leadership development. Although it is not known what brought this group together at the beginning of the study, the group was stable over the school year and all three cadets showed improvement in either their MPA or their GPA. While peer group influences cannot be established as causing the leadership trajectory of these cadets, it is likely that the social context provided a good environment to support and encourage positive changes.

Next, it was expected that most changes in peer groups over the school year would occur in the freshman and junior class which had only been together since June (freshman) or August (junior). In order to examine the stability of the individuals in the four classes of cadets, the group stability criteria described in chapter two was modified to create a measure of individual stability for use in this analysis.

Each participant, who was a member of a peer group of at least three persons at a given time point, was coded as stable if they were in a stable peer group at a subsequent time point and they were one of the stable members of the group. If they were not a stable member or were in an unstable peer group they were coded as unstable. For example, assume a hypothetical group consists of Elizabeth, James, Alan, and Mac. If Elizabeth and

James remained together at time two but Alan and Mac moved to different groups, the group would be a stable group because at least 50% of the group members (Elizabeth and James) remained together. However, for this analysis, only Elizabeth and James would be considered stable members because they remained with the original group while Alan and Mac would be coded as unstable members because they were no longer affiliated with the original peer group. Assume a different hypothetical group consisted of a five cadets: Eric, Mark, David, Jacob, and Jill at time one. If Eric and Jill were still together but Mark, David, and Jacob moved to different groups at time two, the group would be coded as unstable because less than 50% of the members still remained. Since the group was unstable, Eric, Mark, David, Jacob, and Jill would all be classified as unstable. Separate analyses were done for T_1 to T_2 groups, T_1 to T_3 groups, and T_2 to T_3 groups. The results are summarized in Table 4.3.

Freshman and juniors were not more likely to be unstable members of peer groups than their squadron mates, although isolated cells showed less stability (i.e., freshman in squadron H from T_1 to T_2). A between squadron effect on overall individual stability did occur. Cadets in squadron H increased in stability over the school year while cadets in squadron A decreased in stability over the school year. For T_1 to T_2, the stability of cadets in squadron A was higher than in squadron H (χ^2 (1)= 5.65, $p = .02$). From T_1 to T_3 and from T_2 to T_3, the difference reversed with squadron H becoming more stable (T_1 to T_3: χ^2 (1) = 4.32, $p = .03$; T_2 to T_3: χ^2 (1) = 12.08, $p < .001$).

Table 4.3: Stability of Individuals within Peer Groups over the Academic Year with Dyads Removed.

	Aug. 97 to Nov. 97 (T_1 to T_2)	Aug. 97 to Apr. 98 (T_1 to T_3)	Nov. 97 to Apr. 98 (T_1 to T_3)
Squadron A Stable Members			
Stable Seniors	33% (5/15)	40% (6/15)	60% (9/15)
Stable Juniors	60% (6/10)	60% (6/10)	63% (10/16)
Stable Sophomores	100% (14/14)	65% (9/14)	52% (14/27)
Stable Freshman	94% (15/16)	56% (9/16)	52% (12/23)
Squadron Total	73% (40/55)	55 % (30/55)	56% (45/81)
Squadron H Stable Members			
Stable Seniors	78% (14/18)	56% (10/18)	84% (16/19)
Stable Juniors	38% (3/8)	75% (6/8)	73% (11/15)
Stable Sophomores	50% (10/20)	75% (15/20)	100% (14/14)
Stable Freshman	18% (2/11)	55% (6/11)	75% (6/8)
Squadron Total	51% (29/57)	65% (37/57)	84% (47/56)
Squadron A Unstable Members			
Unstable Seniors	67% (10/15)	60% (9/15)	40% (6/15)
Unstable Juniors	40% (4/10)	40% (4/10)	37% (6/16)
Unstable Sophomores	0% (0/14)	36% (5/14)	48% (13/27)
Unstable Freshman	6% (1/16)	44% (7/16)	48% (11/23)
Squadron Total	27% (15/55)	45% (25/55)	44% (36/81)
Squadron H Unstable Members			
Unstable Seniors	22% (4/18)	44% (8/18)	16% (3/19)
Unstable Juniors	62% (5/8)	25% (2/8)	27% (4/15)
Unstable Sophomores	50% (10/20)	25% (5/20)	0% (0/14)
Unstable Freshman	82% (9/11)	45% (5/11)	25% (2/8)
Squadron Total	49% (28/57)	35% (20/57)	16% (9/56)

The next hypothesis was that individual network centrality would remain stable over the school year. In other words, if a cadet is a nuclear member of the overall social network at time one, she would most likely be a nuclear member at time point three. Continuities for individual network status (nuclear, secondary, peripheral, marginal, and isolate) were computed by calculating the probability of being in a given network status conditioned on the cadet's network status at a prior time point. Because of a large number of sparse cells in the tables when all five statuses were used, the individual network centralities were collapsed into a dichotomous measure of central (nuclear or secondary network status) and not central (peripheral, marginal, or isolate network status). (Complete count data for the original five levels of network status are in Appendix H.) The probabilities for the social network status conditioned on prior time points for central and not central network status are in Table 4.4. These results suggest that cadets are more likely to stay in the same network status across time points, although a portion of the cadets do change status either up or down.

A second analysis to investigate stability was conducted to test the hypothesis that cadets who do change peer groups over the school year (the unstable cadets in Table 4.3) would rejoin new peer groups with the same centrality to their prior peer group. A cadet who was a member of a medium centrality group at time one and changed groups over the semester would be expected to rejoin a group that also had medium centrality within the social network. To analyze this hypothesis, the unstable cadets in Table 4.3 were selected and the stability of their group centrality was computed by the probability of their new group's centrality conditioned on their original group centrality. These probabilities are reported in Table 4.5.

Table 4.4: Continuity of Overall Network Status in both Squadrons' Social Networks.

	End of the Year Network Status (April 1998)		
	Central	Not Central	Total
T_1 to T_3 Network Status Continuity			
Central Status in August 1997	51 (.57)	34 (.30)	85
Not Central Status in August 1997	39 (.43)	80 (.70)	119
Total	90	114	204
T_2 to T_3 Network Status Continuity			
Central Status in November 1997	61 (.68)	36 (.32)	97
Not Central Status in November 1997	29 (.32)	78 (.68)	107
Total	90	114	204

Notes: Central network status includes nuclear and secondary members of the social network. Not Central network status includes peripheral, marginal, and isolate members of the social network. Overall n = 204 because five cadets in April 1998 (T_3) were no longer in the study due to disenrollment or resignation from the Academy.

T_1 -T_3: χ^2 (1) = 14.91, $p < .001$.
T_2 - T_3: χ^2 (1) = 26.43, $p < .001$.

Table 4.5: Probability of rejoining a Peer Group of the Same Network Centrality as a Prior Peer Group for Unstable Cadets Who Change Groups over Time.

	Aug. 97 to Nov. 97 (T_1 to T_2)	Aug. 97 to Apr. 98 (T_1 to T_3)	Nov. 97 to Apr. 98 (T_2 to T_3)
Squadron A - Centrality of New Peer Group			
Equal Centrality as Prior Group	5 (.36)	6 (.24)	8 (.22)
Different Centrality as Prior Group	5 (.36)	8 (.32)	8 (.22)
No Group at Second Time Point[a]	4 (.29)	11 (.44)	20 (.56)
Total Unstable Cadets	14	25	36
Squadron H - Centrality of New Peer Group			
Equal Centrality as Prior Group	4 (.14)	5 (.25)	3 (.33)
Different Centrality as Prior Group	10 (.36)	5 (.25)	2 (.22)
No Group at Second Time Point[a]	14 (.50)	10 (.50)	4 (.44)
Total Unstable Cadets	28	20	9

Note: Sums not totaling to 1.00 are due to rounding.
[a]Marginal, Isolate, Disenrolled, or Resigned

The proportions in Table 4.5 suggest that unstable cadets tended to move both up and down in terms of the centrality of their new peer group. Over all measurement points, 63 (48%) of the unstable cadets moved to the no peer group status at a subsequent time point. Of the 38 (29%) cadets who moved to a group with different centrality, 27 (20%) moved to a group with lower network status and 11 (8%) moved to a group with a higher network status. The remaining 31 (23%) unstable cadets moved to a group of equal network status. Overall, 42 of the 132 (32%) unstable cadets across all time points either stayed in the same centrality group or moved to a higher centrality group while 90 of the 132 (68%) either moved to a group with lower centrality or moved to a status without a group affiliation.

To test whether the central cadets performed better in academic or military performance, t-tests for grade point average (GPA) and military performance average (MPA) were conducted at each time point. For all measurement points, there were no significant differences ($p < .05$) for either GPA or MPA. Additional t-tests for the fall ICS scales for central versus non-central cadets at each time point also found no significant differences at T_1 or T_2. At T_3, central cadets had a slightly higher mean rating (5.00, sd = .95) than non-central cadets (4.70, sd = .98) on the ICS leadership scale ($t = 2.03$, $p = .045$).

Analysis of peer nominations for being one of the most respected in the squadron or best exemplifying Academy core values showed central cadets to be more frequently nominated than non-central cadets at all three time points. (The relationship between informal leadership and centrality is covered later in the chapter.) The differences were larger at T_2 and T_3 than at T_1, which is not surprising since the cadets had spent little time together at T_1. Table 4.6 reports only T_3 results since T_2 and T_3 results were almost identical.

Table 4.6: Proportion of Central and Non-Central Cadets Nominated as One of the Most Respected in the Squadron or as Best Exemplifying Academy Core Values at T_3.

	End of the Year Network Status (April 1998)		
	Central	Not Central	Total
T_3 Most Respected Nominations			
One or More Nominations	46 (.51)	32 (.28)	78
No Nominations	44 (.49)	82 (.72)	126
Total	90	114	204
T_3 Best Exemplifies Academy Core Values Nominations			
One or More Nominations	47 (.52)	36 (.32)	83
No Nominations	43 (.48)	78 (.68)	121
Total	90	114	204

Notes: Central network status includes nuclear and secondary members of the social network. Not Central network status includes peripheral, marginal, and isolate members of the social network. Overall n = 204 because five cadets in April 1998 (T_3) were no longer in the study due to disenrollment or resignation from the Academy.

Respect: χ^2 (1) = 11.31, p = .001.
Core Values: χ^2 (1) = 8.88, p = .003.

In summary, most cadet peer groups and most cadets have highly stable centrality over the school year. Cadets in unstable peer groups tend to move to groups with less centrality than their previous peer groups, but about 30% remain in groups of equal or higher network centrality. Cadets tended to retain their centrality over the school year as long as they remained in their peer group. Finally, central cadets did not perform better on their MPA or GPA than non-central cadets but they were more likely to be nominated as being one of the most respected or one of the cadets in the squadron best exemplifying Academy core values.

Formal and Informal Leadership

Before analyzing the relationship between formal and informal leaders, definitions of these two types of leadership needed to be operationalized. At each time point, cadets could nominate up to three individuals within the squadron as one of the best leaders. Most cadets at each time point received no nominations (82% at time one, 57% at time two, and 67% at time three) and the number of cadets receiving more than six nominations was very small (5% at each time point). Based on these distributions, it was decided to create a dichotomous variable for informal leadership with informal leadership defined as receiving one or more nominations as a best leader.

Two measures of formal leadership were obtained from the cadets. The first came from cadet responses to the following question on their survey at each time point:

> "Do you currently hold a formal leadership position at USAFA? (We define a formal leadership position is defined as a position officially related to the operations of the cadet wing chain of command requiring you to write one or more performance ratings on other cadets. Do not include non-supervisory jobs, clubs, or off-base activities.)"

This constituted a self-report measure of formal leadership. In addition, cadet leadership positions were available from official cadet records. The following positions were considered to be formal leadership positions because they involve direct supervision of other cadets:

1. All wing and group staff members
2. Upper level squadron staff (responsible for the overall supervision of the squadron, including: Commander, First Sergeant, Operations Officer, Adjutant)
3. Flight Leadership (each squadron is divided into three equal flights of about 30-40 cadets with a Flight Commander and a Flight Noncommissioned Officer in leadership positions)
4. Element Leadership (each flight is divided into three equal elements of about 10 to 13 cadets with an Element Leader and Element Noncommissioned Officer in leadership positions)

Because supervisory positions (formal leadership) in the squadron are primarily junior and senior class responsibilities, formal leadership in official cadet records is restricted to these two classes. In addition, most of the informal leadership nominations were received by junior and senior cadets. At time one, 78.4% of the informal leaders were juniors or seniors. At time two, 72.7% were juniors or seniors, and at time three, it was 79.7%. Therefore, the remaining analysis of formal and informal leadership in this section was done using only data from juniors and seniors.

At T_1, 105 junior and senior cadets had complete data on peer nominations, 87 had leadership data available from official records, and 54 had self-report data on formal leadership position. At T_2, 105 cadets had complete data on peer nominations, 89 had leadership data available from official records, and 55 had self-report data on formal

leadership position. At T_3, 105 cadets had complete data on peer nominations, 89 had leadership data available from official records, and 57 had self-report data on formal leadership position. Because the correlation between the two measures of formal leadership was high (.65 at time one, .61 at time 2, and .75 at time 3), only the official record of formal leadership was used in the remaining analyses. This measure was chosen over the self-report because it was considered a more accurate measure of formal leadership and because just over 30 additional cadets had official record data on formal leadership than on self-reported formal leadership at each time point.

It was hypothesized that informal leaders would maintain higher stability because formal leadership positions rotate on a semester basis. To test the stability of peer and formal leaders, correlations for formal leadership and informal leadership were computed for all three time points. Although there is likely to be some overlap between informal and formal leadership, it was also hypothesized that formal and informal leaders would often be different people. It was expected that the correlation between informal leaders and formal leaders would be positive but not significant at each time point. Table 4.7 shows the correlations between formal and informal leadership as measured by peer nominations and official record of formal leadership at time points two and three. By limiting the peer nomination data to times two and three, both juniors and seniors would have sufficient time in the squadron to allow for accurate peer nominations of leadership. At time one, juniors would have been in the squadron such a short time that accurate evaluations of leadership effectiveness by their peers may not be reliable. The complete correlation matrix with data from all three time points and all three leadership measures (peer nominations, self-reported formal leadership, and official record formal leadership) is in Appendix I.

The correlation between informal leadership from T_2 to T_3 is .49 ($p < .001$) while the correlation between formal leadership at time two and time three is -.08. The correlations between formal and informal leadership support the hypothesis that while there is some overlap between formal and informal leadership, there are many cadets who are considered to be leaders by their peers who are not in a position of formal leadership. The correlations between formal and informal leadership are modest and significant, but only when the measures are taken at the same time.

Using the formal and informal leadership categories in Table 4.7, several categories of leadership could be developed. The simplest would be to examine leadership as either a "formal - not formal" or an "informal - not informal" dichotomy. A "formal - informal" leader dichotomy would not be as efficient since a cadet leader could fall into both the formal and the informal leader category and some cadets would not be formal nor informal leaders.

Another way to categorize leadership would be to include all different combinations of leadership represented by the "formal - informal" leadership distinction in a four leadership category taxonomy. Non-leaders would be neither formal nor informal leaders; formal leaders would be in a formal position of leadership but would not receive best leader nominations; informal leaders would receive peer nominations as a best leader but would not be in a formal leadership position; and both informal and formal leaders would be in a position of leadership and receive nominations as peer leaders.

Table 4.7: Phi Correlations Between Formal Leadership Position from Official Record Data and Informal Leadership for Juniors and Seniors at Time Points Two and Three.

	1	2	3	4
1. Formal Leader Time 2	1.00			
	(89)			
2. Formal Leader Time 3	-.08	1.00		
	(89)	(89)		
3. Informal Leader Time 2	.25*	-.02	1.00	
	(87)	(89)	(105)	
4. Informal Leader Time 3	.14	.19+	.49***	1.00
	(89)	(89)	(105)	(105)

Note: N for each correlation in parentheses. Phi correlations were used because the formal leadership data is dichotomous. The correlation between informal leader at T_2 and informal leader at T_3 becomes larger if ordered categories are used instead of the Phi correlation for dichotomous variables. A Spearman rank correlation on five categories of informal leadership status (1: no nominations; 2: 1-2 nominations, 3: 3-5 nominations, 4: 6-10 nominations, and 5: 11 or greater) was .635.
$^{+}p < .10$. $^{*}p < .05$. $^{***}p < .001$.

In between the two and four category breakdowns, a possible three category combination might include non-leaders who receive no nominations as one of the best leaders and were not in a leadership position; formal leaders were in a position of leadership but did not receive nominations as one of the best leaders; and informal leaders received at least one nomination as a best leader regardless of formal leadership position. Each of the possible combinations above were tested on a variety of variables to determine if distinctions in leadership status were evident in peer nominations, supervisor ratings, self-ratings, and official performance ratings. Regardless of the number of leadership categories tested, the same pattern of results was found. Informal leaders were consistently ranked higher on several variables than cadets who did not receive nominations for being a best leader. There were no other consistent patterns of results in the three or the four category taxonomies. Because the informal versus not informal difference was the only consistent finding regardless of the leadership taxonomy selected, only the two category results will be reported. A summary of the significant differences between informal versus not informal leaders is located in Table 4.8.

Although informal leaders were not higher than other cadets on all measures, informal leaders showed a consistent pattern of higher performance than other cadets in the squadron on a variety of measures (self-reports, supervisor reports, peer nominations, and official performance ratings). These differences were greater at T_3 than T_2 and informal leaders were higher on more measures at T_3 than T_2. This suggests that the differences between informal leaders and other cadets may grow larger as the school year progresses.

Table 4.8: Significant Differences Between Cadets Receiving One or More Nominations for Best Leader (Informal Leaders) and Cadets not Receiving Nominations (Not Informal Leaders).

	Not Informal Leaders	Informal Leaders	P
Time 2 - November 1997			
Percent Receiving Peer Nominations for Best Leader After Graduation (n = 89)	30%	84%	< .001
Percent Receiving Peer Nominations for Most Respected in the Squadron (n = 89)	33%	73%	< .001
Percent Receiving Peer Nominations for Best Exemplifies Academy core values (n = 89)	33%	68%	.002
Military Performance Average (MPA) (n = 89)	2.64	2.95	.004
ICS Leadership Scale (n = 60)	4.71	5.25	.070
Time 3 - April 1998			
Percent Receiving Peer Nominations for Best Leader After Graduation (n = 89)	19%	85%	< .001
Percent Receiving Peer Nominations for Most Respected in the Squadron (n = 89)	19%	79%	< .001
Percent Receiving Peer Nominations for Best Exemplifies Academy core values (n = 89)	21%	83%	< .001
Military Performance Average (MPA) (n = 89)	2.64	3.00	< .001
ICS Leadership Scale (n = 60)	4.73	5.35	.024
Grade Point Average (GPA) (n = 89)	2.86	3.13	.007
Self-Report of Leadership Ability (n = 56)	4.81	5.57	.029

Notes: Peer nominations used a chi-square significance test, remaining tests were t-tests. Complete statistical tables are located in Appendix I.

Because the "informal - not informal" leadership distinction appeared consistent, these categories were used in the final analysis on leadership status and network centrality. It was expected that informal leaders would be more central in the social network than cadets not nominated as best leaders. In addition, since formal leaders are assigned to their positions of leadership, it was not expected that formal leaders would differ in network centrality than cadets not in formal leadership positions. In order to test both formal and informal leadership relations to network centrality, separate two by two contingency tables were analyzed at each time point for informal leadership status and for formal leadership status. These results are reported in Tables 4.9 and 4.10.

Over half of the informal leaders were central members of the overall social network at both time points. About 75% of the cadets not receiving peer nominations as informal leaders were not central in the peer network at time two and about 67% were not central at time three. These results suggest that the informal leaders within the squadron are the most frequently nominated cadets in the most central peer groups in the squadron. There is a significant correlation between being a visible member of the social network and being considered a leader by one's peers. The same pattern of results is not evident in the formal leader data.

Table 4.9: Relationship of Overall Network Status to Informal Leadership Status for Juniors and Seniors in Both Squadrons at Time Points Two and Three.

	Peer Nominations for Best Leaders		
	No Nominations	One or More Nominations	Total
Time 2 (Nov. 97) Network Status			
Central	10 (.24)	35 (.55)	45
Not Central	31 (.76)	29 (.45)	60
Total	41	64	105
Time 3 (Apr. 98) Network Status			
Central	17 (.34)	31 (.56)	48
Not Central	33 (.66)	24 (.44)	57
Total	50	55	105

T2: χ^2 (1) = 9.37, p = .002 T3: χ^2 (1) = 5.28, p = .022

Table 4.10: Relationship of Overall Network Status to Formal Leadership Status for Juniors and Seniors in Both Squadrons at Time Points Two and Three.

	Not in a Formal Leadership Position	In a Formal Leadership Position	Total
Time 2 (Nov. 97) Network Status			
Central	19 (.45)	19 (.40)	38
Not Central	23 (.55)	28 (.60)	47
Total	42	47	89
Time 3 (Apr. 98) Network Status			
Central	18 (.41)	22 (.49)	40
Not Central	26 (.59)	23 (.51)	49
Total	44	45	89

T2: χ^2 (1) = 0.21, p = .647 T3: χ^2 (1) = 0.57, p = .449

Leadership Measurement Model

A leadership measurement model was estimated in an empirical test of the two factors of leadership (formal and informal leadership) proposed in this thesis. The first factor, formal leadership, is a measure of a person's leadership position. This is akin to the concept of headship described by Insko and Schopler (1972) or legitimate power proposed by French and Raven (1959). Informal leadership is a measure of cadet perceptions of another cadet's leadership ability. It is similar to the concept of referent power. It may be thought of as 'perceived' leadership in the sense that it is the leadership ability of an individual measured by the cognitive perceptions of others.

The latent variable of formal leadership was measured by two observed variables: Self-reports of formal leadership and the leadership position identified from the official record data. Both observed formal leadership variables were coded so that cadets on wing or group staff were given a five; cadets in squadron leadership positions (squadron commander, squadron operations and assistant operations officer, squadron adjutant, squadron first sergeant, and squadron operations noncommissioned officer (NCO)) were given a four; flight commanders and flight NCO's were given a three; element leaders and flight NCO's were given a two; and the remainder of the cadets in the squadron were given a one. This coding scheme was an ordered category with the higher categories representing higher levels of leadership responsibility.

The latent variable of informal leadership was measured by three observed variables: Peer nominations for best leader, peer nominations for most respected, and the ICS leadership scale. Best leader nominations and most respect nominations were coded to five ordered categories (1 = no nominations, 2 = 1 to 2 nominations, 3 = 3 to 5 nominations, 4 = 6

to 10 nominations, and 5 = 11 or more nominations). These categories were coded to create ordered categories similar to the formal leadership observed variables described above. The ICS leadership scale was a one to seven scale with seven indicating the highest level. The model is depicted in Figure 4.1. For the spring semester, 81 cadets were included in the model. An identical model using fall semester data was also tested as a cross-validation model and 97 cadets had complete data. Missing data were handled using listwise deletion. Due to a large amount of missing data, especially for the ICS measure and self-reports of leadership position, data imputation methods were not used. Two related linear modeling frameworks, structural equation modeling (SEM) and factor analysis, were used to test the correct specification of the two-factor model of leadership (Tanaka, Panter, Winborne, & Huba, 1990).

Structural Equation Model

Because most of the variables were non-normal (self-report of leadership position, official record of leadership position, best leader peer nominations, most respect peer nominations) the assumption of multivariate normality required by maximum likelihood (ML) estimation could not be met. The Asymptotically Distribution Free (ADF) estimator (Browne, 1984) does not assume multivariate normality of the underlying distribution. However, the ADF estimator does require large sample sizes (n = 500 or greater) to prevent producing a model chi-square statistic that is too high (West, Finch, & Curran, 1995). Low sample sizes tend to inflate the chi-square, increasing the likelihood of rejecting the model if the model was actually a good fit to the population. Using ADF estimation with these data would increase the likelihood of rejecting a true model. Since less than one half the sample was used for the spring analysis and fall analysis, a prudent strategy with these data would be

to replicate the results with new data before using the model in an applied setting. Thus, the greater likelihood of rejecting a true population model was deemed to be an acceptable error. Table 4.11 contains the correlations, means, and standard deviations for the spring model and Table 4.12 contains the same information for the fall model. AMOS 3.6 (Demo, Arbuckle, 1997) was used to fit the model using the ADF estimation option and the raw data.

The model for the spring data showed good fit (χ^2 (4) = 2.50, p = .645, GFI = 0.98, RMSEA = .000). The standardized regression weights for each variable are shown on Figure 4.1. All observed variables had high loadings on the latent variables except the ICS leadership scale. A model with the ICS leadership path fixed to zero was tested to see if the model fit would significantly decrease. The model did not fit the data as well (χ^2 (5) = 9.63, p = .086) and the change in chi-square was significant ($\Delta\chi^2$ (1) = 7.13 , $p < .01$) indicating the model without the ICS leadership scale was a significantly poorer fitting model. Therefore, the ICS leadership scale was left in the model.

If formal leadership and informal leadership are measuring the same aspects of a single leadership construct, the variance between formal and informal leadership should be close to unity. As a test of the two-factor theory of leadership, the correlation between formal and informal leadership was fixed to unity and the model showed a significant decrement in fit (χ^2 (5) = 95.41, $p < .001$; $\Delta\chi^2$ (1) = 92.91, $p < .001$). This suggests that formal and informal leadership are in fact different constructs in this model and provides support for a two-factor leadership model.

Figure 4.1: Two Factor Leadership Measurement Model, T_3 Data (n = 81).

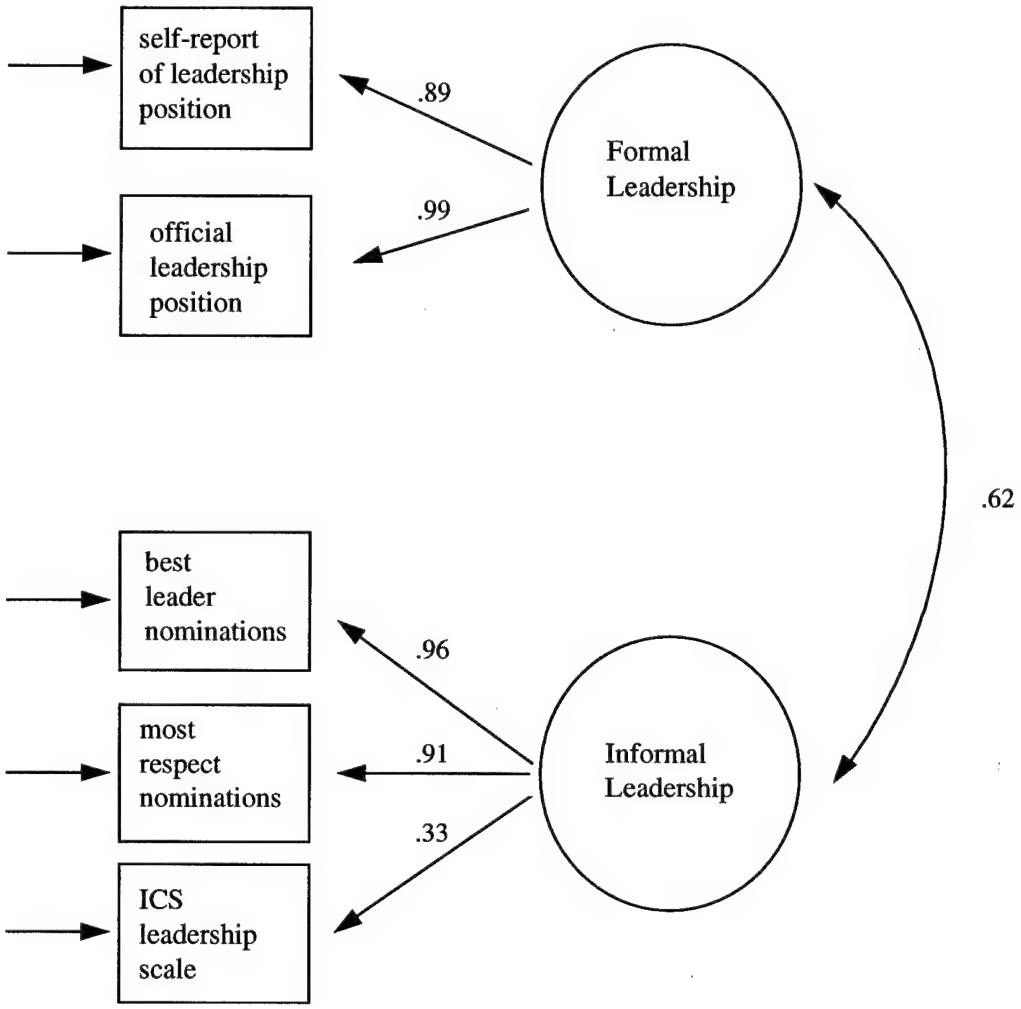


Table 4.11. Correlations, Means and Standard Deviations of Variables Used in Constructing the Leadership Measurement Model During the Spring Semester (n = 81).

	1	2	3	4	5
1. Self-report of Leadership Position	1.00				
2. Official Record of Leadership	.82***	1.00			
3. Best Leader Nominations	.37**	.51***	1.00		
4. Most Respect Nominations	.34**	.47***	.77***	1.00	
5. ICS Leadership Scale	.07	.17	.36**	.40***	1.00
Mean	1.26	1.36	1.75	1.84	4.80
Standard Dev.	.65	.75	1.14	1.15	1.15

Note: Correlations are Spearman rank correlations except correlations with ICS leadership scale which are polyserial correlations.
**$p < .01$. ***$p < .001$.

Table 4.12. Correlations, Means and Standard Deviations of Variables Used in Constructing the Leadership Measurement Model During the Fall Semester (n = 97).

	1	2	3	4	5
1. Self-report of Leadership Position	1.00				
2. Official Record of Leadership	.90***	1.00			
3. Best Leader Nominations	.37	.46***	1.00		
4. Most Respect Nominations	.27**	.36***	.62***	1.00	
5. ICS Leadership Scale	.13	.19	.47***	.58***	1.00
Mean	1.49	1.53	1.90	1.81	4.85
Standard Dev.	.93	.97	1.18	1.09	.96

Note: Correlations are Spearman rank correlations except correlations with ICS leadership scale which are polyserial correlations.
**$p < .01$. ***$p < .001$.

The fall semester model did not fit the data as well as the spring semester model (χ^2 (4) = 8.85, p = .065, GFI = 0.96, RMSEA = .11). Even more importantly, the error variance in the model for the self-report of leadership position observed variable was negative, possibly a result of high multicollinearity between the self-report of leadership position and the official record leadership position variables. When the path from ICS leadership to informal leadership was set to zero, as was done for the spring model, the error variance was still negative and the model showed significantly worse fit ($\Delta\chi^2$ (1) = 17.85, p < .001). Fixing the correlation between formal and informal leadership to one, eliminated the negative error variance, but as with the spring data, the model fit was extremely poor (χ^2 (5) = 94.31, p < .001, GFI = .56, RMSEA = .43).

Factor Analytic Model

A principal axis extraction with an oblique rotation was used to identify the factor pattern matrix of the same spring and fall semester data. An eigenvalue of greater than one was set as the factor criteria. For both the spring and the fall data, the principal axis structure yielded two factors with eigenvalues greater than one. Inspection of the scree plot at both time points suggested that two factors were a reasonable number of factors for the data. For the fall semester, the two factors accounted for 84.1% of the variance and in the spring semester, the two factors accounted for 80% of the variance. Table 4.13 shows the factor loadings of the two factors.

Table 4.13: Factor Pattern Matrix of Five Leadership Model Variables, Principal Axis Extraction, Oblique Rotation (Oblimin, delta = 0), T_1 (n = 97) and T_3 data (n = 81).

	Fall Semester		Spring Semester	
	Informal Leadership	Formal Leadership	Informal Leadership	Formal Leadership
Most Respect Nominations	.97	.00	.91	.01
Best Leader Nominations	.76	-.22	.87	-.07
ICS Leadership Scale	.56	.07	.38	.02
Self-Reported Leadership Position	-.06	-.96	-.03	-.97
Official Record Leadership Position	.09	-.95	.04	-.89
Eigenvalue	2.95	1.25	2.98	1.02
% of Variance Accounted For	59.1	25.0	59.5	20.4

Note: Factor correlations: fall, r = -.39; spring, r = -.55. Most respect and best leader nominations are coded: 1 = no nominations, 2 = 1 or 2 nominations, 3 = 3 to 5 nominations, 4 = 6 to 10 nominations, 5 = 11 or more nominations. ICS leadership scale ranges from 1 (low) to 7 (high). Self-Report of leadership position and official record of leadership position are coded: 1 = no position, 2 = element level leadership position, 3 = flight level leadership position, 4 = squadron level leadership position, 5 = group or wing level leadership position.

Because informal and formal leadership were theorized to be related, using an oblique rotation allowed the two factors to be correlated. The factor correlation was -.54 for the spring semester data and -.39 for the fall semester data. The negative correlation reflects the negative loadings for the formal leadership factor. The factor loadings at each time point are very consistent and showed a similar pattern as the standardized regression weights found in the SEM analysis (Figure 4.1). The best leader and most respected peer nominations along with the ICS leadership scale load consistently on the factor labeled informal leadership while the self-reported leadership position and the official record leadership position load consistently on the factor labeled formal leadership.

While it would be prudent to replicate these results before the measurement model is used in other research or applied settings, the data support the hypothesis that informal and formal leadership are distinct, yet correlated constructs. Leadership is best conceptualized as being related to both the formal position a person holds in the organization, as well, as the judgments of peers and supervisors within the organization. The consistency of the two-factor solution along with the poor fit of the SEM models when the correlation between informal and formal leadership was fixed to unity suggests that a single construct of leadership is not an appropriate description of these data. These results support the two-factor leadership model. Further work on developing a leadership measurement model using a two-factor approach to leadership holds promise for leadership development research.

Chapter Summary

In summary, most cadet peer groups and most cadets have highly stable centrality over the school year. Cadets in unstable peer groups tended to move to groups with less centrality than their previous peer groups, but about 30% remained in groups of equal or

higher network centrality. Cadets tended to retain their centrality over the school year as long as they remained in their peer group.

Informal leaders differed from other cadets in the squadron. As expected, the informal leaders were stable over the school year while the formal leaders changed from the fall to the spring semester. Formal leaders were positively correlated with informal leaders, but this correlation was modest and only occurred when the data from the same time point were considered. Informal leaders were higher than other cadets in the squadron in terms of official performance ratings, peer nominations, network centrality, self-reports of leadership, and supervisor reports of leadership.

The two-factor approach to leadership holds promise for future research. The model fit suggests that leadership has both formal and informal latent constructs. The formal component was captured by the leadership position, the informal component was captured by the ratings of peers and cadet supervisors. These two constructs are correlated, but distinct aspects of leadership. These results suggest that being in a position of authority is not the same experience as being considered a leader by peers and supervisors.

Chapter 5
Predicting Leadership

This chapter investigates the ability of factors influencing cadets prior to squadron entry, as well as, factors present during the fall semester to predict end of the year leadership performance. Because support for the two-factor model of leadership was found in the previous chapter, leadership outcomes for both formal and informal leadership were predicted using variable-centered and person-centered analyses.

Since a stable measurement model of informal leadership was not found that adequately fit the data (see chapter 4), outcome measures for leadership were chosen from the data collected at T_3. For informal leadership, peer nominations for best leader at T_3 were chosen as the outcome measure. For formal leadership, cumulative MPA was selected. A cadet's formal leadership position was not chosen because these positions change on a semester basis and one's position of leadership is not necessarily reflective of one's leadership ability. It was felt that the MPA would be the best measure of a cadet's progress toward positive leadership ability.

Five variables from the fall semester were selected as predictors for end of the year success. The leadership composite index and the academic composite index were selected because they provide measures of incoming competency for all cadets. Next, the three ICS scales (academic, leadership, and hostile aggression) were selected as supervisor ratings of competency during the fall semester. Of the 209 cadets in the sample, 110 (53%) of the cadets in both squadrons had complete data for the five variables in the fall semester and had

complete data on the outcome variables (cumulative performance averages for MPA, GPA, and best leader nominations) . The variable-centered analysis used the five fall competence variables as predictors in a regression analysis predicting end of the year cumulative GPA, MPA, and informal leadership status. This was done using a hierarchical regression model to first enter race, gender, squadron and class information as statistical controls (Cohen & Cohen, 1975). MPA and GPA data were continuous, normal variables and were predicted using a linear regression model. The informal leadership status was a dichotomous outcome and was predicted using a logistic regression model. The person-centered analysis used the same five variables to cluster the same cadets in similar configurations. These configurations were then used to measure differences in performance averages, peer nominations, and network centrality.[3]

Variable-Centered Analysis

The first two blocks of variables in both equations were demographic variables (gender and race) followed by squadron and class information. To predict cumulative GPA, the academic composite index was entered next. To predict cumulative MPA and informal leadership, the leadership composite index was entered next. Finally, the academic scale of the ICS was entered for predicting cumulative GPA and the ICS hostile aggression and leadership scales were entered for predicting cumulative MPA and informal leadership. ICS variables were entered last to see if supervisor ratings of individual competence would account for additional variance above the variance accounted for by pre-entry measures. A

[3] In the original hypothesis for research aim four, it was predicted that the characteristics of a cadet's peer group, when added to individual measures, would provide a stronger test of the ability of peer effects to predict success or failure at the Academy than using individual measures alone. This test would follow the model used by Xie, Cairns, and Cairns (1996) who used individual competencies in addition to peer group competencies in childhood to predict adolescence outcomes. When cadets were selected for such an analysis, only 29 cadets had complete data for their group, as well as, individually on these predictors during the fall semester. Therefore, the analysis with the group and individual data included was not conducted.

total of 110 cadets had complete data on the predictor and outcome variables. (For the MPA analysis, one outlier (standardized residual 4.29) was removed, n = 109. All other assumptions were met.) The correlations and means of the continuous variables are presented in Table 5.1.

The results for predicting cumulative GPA are shown in Table 5.2. Significant slopes for race and gender are evident with males and ethnic majority cadets having higher predicted GPA's. The addition of class and squadron in step two added significantly to the model ($\Delta R^2 = .118$, $F(6, 103) = 4.01$, $p = .001$). The slope for squadron was not significant but cadets in the upper classes had higher predicted GPA's. The addition of the academic composite score explains a highly significant amount of the variance even after the variance accounted for by steps one and two ($\Delta R^2 = .346$, $F(7, 102) = 85.86$, $p < .001$). This suggests that the academic composite score is a very effective predictor of academic success at the Academy even after demographic variables have been taken into account. The ICS academic item did not add significantly to the model.

Table 5.1: Correlations of Continuous Dependent and Independent Regression Variables (N = 110).

	1	2	3	4	5	6	7	8
1. Academic Composite	1.00							
2. Leadership Composite	.09	1.00						
3. ICS - Academics	.43***	.14	1.00					
4. ICS - Hostile Aggression	.04	.06	.03	1.00				
5. ICS - Leadership	-.12	.16	-.10	.55***	1.00			
6. Cumulative MPA	.25**	.17	.34***	.22*	.20*	1.00		
7. Cumulative GPA	.66***	.31**	.38***	.03	.05	.47***	1.00	
8. Cumulative PEA	-.17	.22*	-.03	-.03	.22*	.14	.09	1.00
Mean	3172	1722	4.20	5.22	4.83	2.78	2.82	2.75
Standard Dev.	278.5	175.7	1.23	1.12	0.98	0.31	0.49	0.43

Note: Higher scores on the popularity and academic ICS variables indicate higher levels on these scales. For aggression, higher scores indicate lower levels of aggression (i.e., the .55 correlation between hostile aggression and leadership indicates that *lower* levels of aggression measured by the hostile aggression scale are positively correlated with *higher* levels of leadership measured by the leadership scale).

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 5.2: Hierarchical Regression Analysis for April 1998 Cumulative GPA Statistically Controlling for Demographic, Squadron, and Class Year Variables (N = 110).

Predictor	F	R^2	ΔR^2	β
Step 1[a]	7.66**	.125	.125	
Race				-.329***
Gender				.098
Step 2[b]	5.50**	.243	.118**	
Race				-.307**
Gender				.130
Squadron				.010
Class Year Dummy 2				-.222*
Class Year Dummy 3				-.360**
Class Year Dummy 1				-.046
Step 3	20.92***	.589	.346***	
Race				-.191**
Gender				.134*
Squadron				.003
Class Year Dummy 2				-.260**
Class Year Dummy 3				-.332***
Class Year Dummy 1				-.072
Academic Composite				.603***
Step 4	18.23***	.591	.002	
Race				-.192**
Gender				.131*
Squadron				-.007
Class Year Dummy 2				-.253**
Class Year Dummy 3				-.330***
Class Year Dummy 1				-.077
Academic Composite				.584***
Fall ICS Academic				.044

Notes: *F* statistic and R^2 are reported for the full model at each step. ΔR^2 = increment change in R^2 at each step. β = standardized partial regression coefficient.

*p < .05 **p < .01 ***p < .001

[a]Gender is coded 1 = male, 0 = female. Race is coded 0 = white, 1 = other.

[b]Squadron is coded 1 = squadron H, 0 = squadron A. Class is dummy coded with the following coding scheme:

	dummy 1	dummy 2	dummy 3
1998	0	0	0
1999	1	0	0
2000	0	1	0
2001	0	0	1

The results for predicting cumulative MPA are shown in Table 5.3. Again a significant beta for race was evident. Ethnic minorities have a lower slope than ethnic majority students in the final model. Gender differences were not significant in predicting cumulative MPA. Adding squadron and class information in step two did add significantly to the explained variance ($\Delta R^2 = .132$, $F(6, 102) = 4.24$, $p = .001$). The change in R^2 with the addition of the leadership composite score was also statistically significant ($\Delta R^2 = .017$, $F(7, 101) = 2.21$, $p = .04$), but the effect size of the change was minimal. The addition of the ICS hostile aggression and leadership variables did not add significantly to the model. There is much more variability in predicting the military performance of cadets at the Academy than academic performance. One possible source of the variance could be early performance in basic training. Basic training MPA's were not available for 27 cadets (26 freshman and one junior). A regression equation on the remaining 83 cadets, using basic training MPA as a fourth step followed by the ICS variables on the fifth step in the regression, did account for slightly more variance in the overall model ($R^2 = .275$), but the addition did not effectively raise the ability to predict MPA from early experiences or pre-entry information.

Table 5.4 shows the results for the logistic regression on informal leadership. Race and gender were not significantly different in levels of end of year informal leadership. The addition of squadron and class information did significantly increase the model chi-square. The addition of the leadership composite index did not add to the model, but unlike predicting MPA, the addition of the ICS-scales did add to the model. The ICS leadership scale in the fall semester was a significant predictor of informal leadership status at the end of the year.

Table 5.3: Hierarchical Regression Analysis for April 1998 Cumulative MPA Statistically Controlling for Demographic, Squadron, and Class Year Variables (N = 109).

Predictor	F	R^2	ΔR^2	β
Step 1[a]	4.28*	.075	.075	
Race				-.268**
Gender				-.091
Step 2[b]	4.43**	.207	.132**	
Race				-.251**
Gender				-.053
Squadron				-.076
Class Year Dummy 2				-.282*
Class Year Dummy 3				-.432***
Class Year Dummy 1				-.216*
Step 3	4.17***	.224	.017*	
Race				-.223*
Gender				-.054
Squadron				-.099
Class Year Dummy 2				-.287**
Class Year Dummy 3				-.423***
Class Year Dummy 1				-.230*
Leadership Composite				.138
Step 4	3.80***	.257	.033	
Race				-.239*
Gender				-.028
Squadron				-.083
Class Year Dummy 2				-.274*
Class Year Dummy 3				-.387***
Class Year Dummy 1				-.256*
Leadership Composite				.119
Fall ICS Hostile Aggression				.128
Fall ICS Leadership				.089

Notes: *F* statistic and R^2 are reported for the full model at each step. ΔR^2 = increment change in R^2 at each step. β = standardized partial regression coefficient.

*p < .05 **p < .01 ***p < .001

[a]Gender is coded 1 = male, 0 = female. Race is coded 0 = white, 1 = other.

[b]Squadron is coded 1 = squadron H, 0 = squadron A. Class is dummy coded with the following coding scheme:

	dummy 1	dummy 2	dummy 3
1998	0	0	0
1999	1	0	0
2000	0	1	0
2001	0	0	1

Table 5.4: Logistic Regression Analysis for April 1998 Informal Leadership Status (0 = No, 1 = Yes) Controlling for Demographic, Squadron, and Class Year Variables (N = 110).

Predictor	χ^2 (df)	$\Delta\chi^2$ (df)	β	SE
Step 1[a]	.39 (2)			
Race			-.06	.23
Gender			-.16	.27
Step 2[b]	26.21*** (6)	25.82*** (4)		
Race			-.14	.27
Gender			-.31	.31
Squadron			-.41	.23
Class Year 1999			.32	.27
Class Year 2000			1.01**	.35
Class Year 2001			1.21**	.37
Step 3	26.39*** (7)	0.19 (1)		
Race			-.13	.27
Gender			-.32	.31
Squadron			-.42	.24
Class Year 1999			.31	.27
Class Year 2000			1.01**	.35
Class Year 2001			1.22**	.37
Leadership Composite			.00	.00
Step 4	35.01*** (9)	8.62** (2)		
Race			-.04	.29
Gender			-.42	.32
Squadron			-.50*	.26
Class Year 1999			.44	.30
Class Year 2000			1.07**	.37
Class Year 2001			1.09**	.38
Leadership Composite			.00	.00
Fall ICS Hostile Aggression			.12	.26
Fall ICS Leadership			.65*	.29

Notes: $\Delta\chi^2$ = increment change in χ^2 at each step. β = estimated value of the regression coefficient (maximum likelihood).

*p < .05 **p < .01 ***p < .001

[a]Gender is coded -1 = male, 1 = female. Race is coded 1 = white, -1 = other.

[b]Squadron is coded -1 = squadron H, 1 = squadron A. Class is coded with the following coding scheme:

	1998	1999	2000	2001
Class Year 1999	1	-1	1	1
Class Year 2000	1	1	-1	1
Class Year 2001	1	1	1	-1

In summary, the regression equations indicate that GPA is more easily predicted from demographic and pre-entry scores than MPA. The academic composite score is an excellent predictor of academic performance measured by GPA. However, predicting military performance from these variables is a much harder task. Although the addition of leadership composite scores was a significant addition to the MPA model statistically, the practical difference was marginal. Informal leadership was predictable from the fall ICS leadership scale. However, neither MPA nor informal leadership were predictable from the pre-entry leadership composite index.

Person-Centered Analysis

While these regression results indicate the usefulness of earlier aptitude and experience to predict later outcomes, especially for GPA, they do not help the commander identify individual cadets who may be more susceptible than other cadets to disciplinary or other problems. Person-centered analysis allows individuals to be grouped together to form homogeneous categories of individuals based on similarities of relevant variables of interest (Magnusson, 1988). For this study, the same cadets and five predictor variables used in the regression analyses were used to identify similar configurations of individuals.

Cluster analysis used Ward's method in the SCM 2.0 program (Bergman & El-Khouri, 1998). The relocate procedure was used to relocate nine of the cadets. Twelve outliers were identified in the data set (11%) and were pruned using the residue procedure leaving 98 cases for analysis. These 98 cases were then reclustered and relocated for a final solution.

For the 98 cadets in the cluster analysis, cluster solutions from two clusters to five clusters were examined. The explained sum of squares ranged from 50.01 for the five cluster solution to 21.72 for the two cluster solution. For each of the cluster solutions, differences between the clusters were tested using one-way ANOVA's for cumulative MPA and cumulative GPA (t-tests for the two cluster solution). In addition, differences between clusters were also tested using chi-square analyses for squadron membership, class, race, gender, probation status at the end of the year, honor list status at the end of the year, informal leader status, core value nominations, most respected nominations, and network centrality. Regardless of the cluster solution used, the only consistent differences were found between cadets in clusters with higher than average levels on the ICS hostile aggression scale and clusters with lower levels of hostile aggression. Since this difference was evident in all the cluster solutions, the two-cluster solution is reported here as it is the most parsimonious solution and it still captures the hostile aggression difference. Figure 5.1 shows the patterns for the two clusters on the clustering variables.

Table 5.5 shows the differences between the two clusters for cumulative MPA and GPA. The aggressive cluster had a lower GPA (not significant) and a lower MPA (p = .065).[4] The difference between the clusters on the end of the year MPA is modest but in the direction predicted. Only two variables were significant when the fall semester "aggressive - non-aggressive" clusters were used to test differences on several categorical outcome variables measured at T_3. The non-significant differences were found with the variables for squadron membership, class year, race, gender, probation status (on or off probation), honor

[4] One small cluster (about 10 cadets depending on the solution) occurred in the three, four, and five cluster solutions that was over one standard deviation above the sample average on the ICS Academic scale and was consistently higher than the other clusters on cumulative GPA. However, other differences between this cluster and other clusters were not significant. In the two cluster solution, most of these cluster members became a part

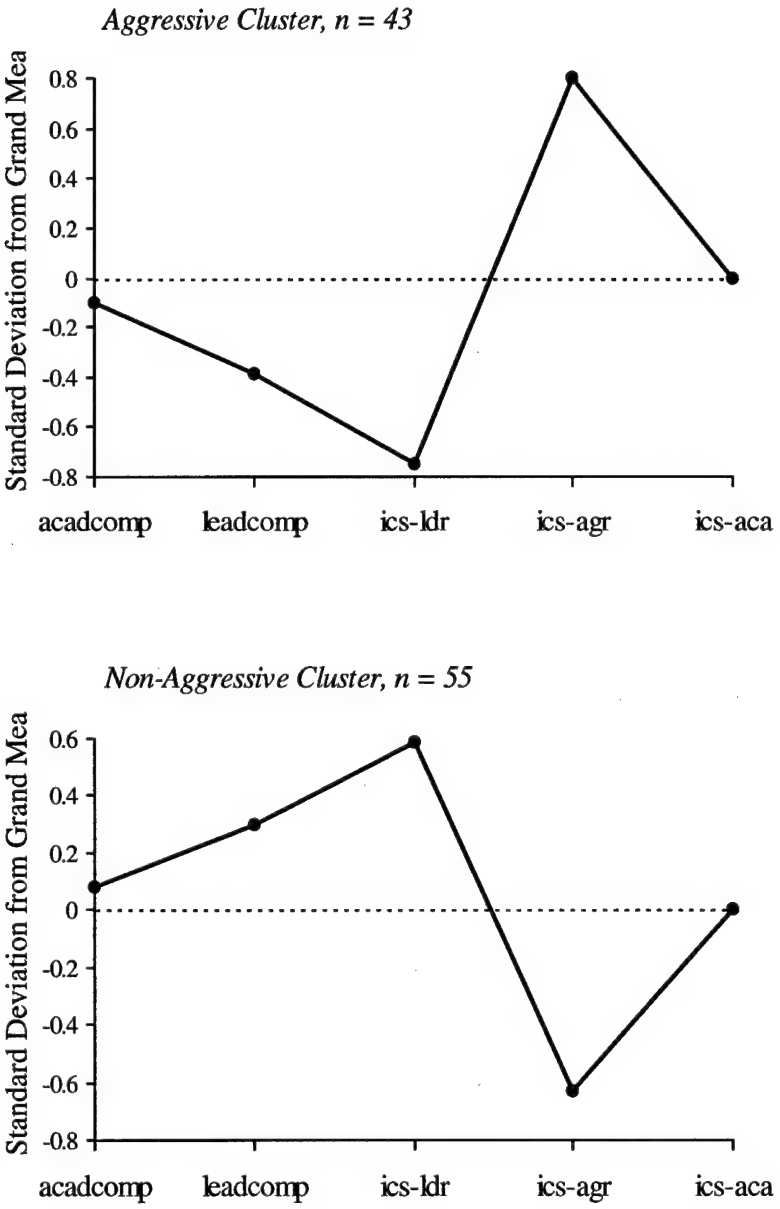
list status (on or off one or more merit lists), peer nominations for best exemplifying core values, and overall network status (central or not central). Informal leadership approached significance and peer nominations for most respected were significant. The results for these two variables are in Table 5.6.

As with the differences in MPA, the differences for informal leadership and for most respected are modest but in the direction expected. This pattern of moderate negative relationships between hostile aggression and MPA, informal leadership, and respect is consistent with other measures of leadership. For the 110 cadets used in the regression analysis, the bivariate correlation between fall ICS hostile aggression scale and cumulative MPA at the end of the school year is -.21 and the correlation between high aggression on the fall ICS hostile aggression scale and high ratings of leadership on the fall ICS leadership scale is -.55 (Table 5.1). This relationship can be seen graphically in Figure 5.1. Cadets within the cluster with high levels of aggression have low ratings on the leadership scale and vice versa. In chapter 3, differences on the hostile aggression scale between informal leaders and other cadets in the squadron were not found. In the cluster analysis, the combination of high aggression with low levels of leadership may explain why differences were found in the cluster analysis but not in the analysis that used differences in informal leadership status alone to test mean differences on the aggression scale.

---

of the non-aggressive cluster and the differences in GPA between the aggressive and non-aggressive clusters became non-significant.

Figure 5.1 Cluster Patterns for the Two Cluster Solution (N = 98)



acadcomp = academic composite index	leadcomp = leadership composite index
ics-ldr = ICS leadership scale	ics-agr = ICS hostile aggression scale
isc-aca = ICS academic scale	

Table 5.5: Means and Differences for the Two Cluster Solution for Cumulative MPA and Cumulative GPA Measured at the End of the School Year (n = 98).

		Aggressive Cluster	Non-Aggressive Cluster	T	p
Cumulative MPA					
	Mean	2.71	2.82	1.87	.065
	Std. Dev.	0.28	0.32		
	Std. Error	0.04	0.04		
Cumulative GPA					
	Mean	2.75	2.85	1.06	.293
	Std. Dev.	0.45	0.52		
	Std. Error	0.07	0.07		

Table 5.6: Number of each Cluster Receiving Peer Nominations for Best Leader and for Most Respected in the Squadron at the End of the School Year.

	Aggressive Cluster	Non-Aggressive Cluster	Total
Informal Leader at T_3			
Informal Leader	10 (.23)	22 (.40)	32
Not an Informal Leader	33 (.77)	33 (.60)	66
Total	43	55	98
Most Respected at T_3			
One or More Nominations	11 (.26)	26 (.47)	37
No Nominations	32 (.74)	29 (.53)	61
Total	43	55	98

Informal Leader: χ^2 (1) = 3.08, p = .079
Most Respected: χ^2 (1) = 4.83, p = .028

Chapter Summary

In summary, cumulative GPA was predictable from the academic composite index, whereas, cumulative MPA was not predictable from the leadership composite index after race, gender, class year, and squadron were statistically controlled for in a hierarchical regression analysis. Informal leadership was predictable from the fall ICS leadership scale, but not from the pre-entry leadership composite index. The low predictability of MPA and informal leadership may be due to a less valid measure of leadership potential, differences in the ways in which leadership and cognitive ability develop during this period, differences in the types of leadership that are successful in high school versus leadership styles that are better suited to the Academy, or differential amounts of influence environmental factors have on leadership versus academic performance (or any combination of these factors). For example, if a cadet becomes a member of a deviant peer group during basic training, that peer group may have greater influence on the cadet's subsequent leadership development than on his academic performance. Without data from a larger number of cadets beginning at the start of basic training and following their progress over their time at the Academy, it cannot be determined which, if any, of these factors may improve the ability to predict leadership performance.

In the person-centered analysis, a moderate but consistent negative relationship between high levels of hostile aggression, as measured by the ICS and several measures of leadership performance, was found. The consistency of the results suggests that high levels of hostile aggression in the fall, especially in configurations that include low supervisor ratings on the ICS leadership scale, predict low levels of leadership performance at the end of the year.

Chapter 6
Summary and Implications

The introductory chapter emphasized that leadership is best defined as a process of influence. Influence involves relationships with others and it was proposed that leadership development is embedded in the social networks within the training environment. It was also proposed that leadership development is more than learning a specific theory or practicing leadership skills with others. Instead, it is a matter of how the individual adapts to and internalizes socially defined norms of behavior. Overall, the results of this study supported the proposal that the squadron social ecology is influential in the leadership development of cadets. Leadership status, especially informal leadership status, is intertwined with a variety of social measures including social network status, peer nominations, and supervisor ratings of leadership competence.

Following a synopsis of the major findings in relation to the original research hypotheses, a discussion of the broader implications of the research will be presented. The chapter will conclude with some limitations of this study and a summary of the research in the context of specific implications relevant to Academy leadership training programs.

Major Findings

The data supported most of the research aims and hypotheses set forth at the beginning of the study and provided new insights into the relationships between peer social networks and leadership development at the Air Force Academy. Specifically, the research demonstrated that methods of identifying social networks previously used primarily in school

settings with children and adolescents (Social Cognitive Mapping) can be effectively employed in large organizational settings with young adults. In addition, the factor structure of the Interpersonal Competence Scale proved to be a sound and efficient measure of individual competence. Combined, the findings provide an overall picture of the importance of the links between cadet social life and cadet leadership development. Summaries of the major findings for each of the original research hypotheses are provided in Table 6.1 for research aims one and two and in Table 6.2 for research aims three and four.

A few of the specific findings merit additional discussion. Two findings suggest homophily plays a role in both individual and squadron level performance. Intraclass correlations on pre-entry competence indices (Figure 3.1) became smaller over the school year indicating that the longer the cadets remained in the squadron, the less entry conditions influenced peer group formation. The characteristics which initially brought groups together were not necessarily the same factors which keep them together. This suggests that as cadets transition through the school year, their peer groups are continually evolving and influencing their relationships in the squadron. This highlights the importance of not drawing conclusions about a cadet based solely on static, pre-evaluations made when the cadet enters the squadron. The social niche the cadet finds in the squadron can serve as an impetus to changing behavior and developing new leadership skills or it can serve to stagnate a cadet in old patterns of behavior.

Table 6.1: Summary of Major Findings (Research Aims One and Two).

Hypothesis	Major Findings
1.1 Cadets will form groups based primarily on propinquity and homophily.	The majority of cadet groups were composed of other cadets from the squadron. Cadets from outside the squadron were on the peripheries of the Social Cognitive Maps. Homophily was not as strong as expected overall and varied between the squadrons. The lower performing squadron had greater similarities in the peer groups on the ICS leadership and hostile aggression scales.
1.2 Cadets will affiliate primarily with cadets in their class.	Cadets did affiliate primarily with the members of their own class. The upper three classes showed more affiliations with cadets outside their class than the freshmen.
1.3 Cadets in wing-level activities will be more likely to affiliate with cadets in other squadrons.	Cadets in wing-level activities (intercollegiates, wing and group staffs, etc.) were not more likely to have peer groups containing members from outside the squadron than other cadets.
2.1 Cadet peer groups will be stable over the school year. Cadets who change peer groups will join new groups with similar characteristics.	About 75% of the peer groups remained stable (at least 50% of the group remained intact) over the school year. Cadets in squadron H showed increasing stability over the year while cadets in squadron A showed decreasing stability. Unstable cadets who changed peer groups were more likely to join a peer group of lower status than a group of equal or higher status.
2.2 Most changes in peer groups over the school year will occur in the freshman and junior class.	Freshman and juniors were not more unstable overall than the other two classes.
2.3 Individual network centrality will remain stable over the school year.	Central cadets tended to remain central and non-central cadets tended to remain non-central. Cadets tended to retain their centrality as long as they remained in stable peer groups.

Table 6.2: Summary of Major Findings (Research Aims Three and Four).

Hypothesis	Major Findings
3.1 Formal and informal leaders will often be different people. Informal leaders will maintain higher stability.	Informal and formal leaders were moderately correlated (r =.25) when measured contemporaneously. Formal leadership over the school year was unstable (r = -.08) demonstrating that different cadets are in formal leadership positions each semester. Informal leadership was stable (r = .64). The leadership measurement model supported the theory that informal and formal leadership are correlated yet distinct components of leadership.
3.2 Informal leaders will be most likely to be well respected and will be the most central members of the social network.	Informal leaders were rated higher in several areas including peer nominations for most respected, best exemplifies Academy core values, and best leader after graduation. Informal leaders also had higher MPA's, GPA's, supervisor ratings (ICS leadership scale), and self-reports of leadership at T_3.
3.3 Centrality within the social network will have a positive relationship to measures of leadership and performance.	Informal leaders were more likely to be central members of the squadron social network than other cadets. Formal leaders had equal centrality with cadets not in a leadership position. Central cadets did not perform better on their MPA or GPA but were more likely to be nominated as being one of the most respected or best exemplifying Academy core values.
4.1 The characteristics of a cadet's peer group will be as good at predicting success or failure at the Academy as individual characteristics and measures.	This hypothesis was not tested directly because of the small number of cadets in the sample with data on both individual and group measures in the fall semester. Predicting MPA was a more difficult task than predicting GPA. A moderate but consistent negative relationship between high aggression and leadership performance was found.

In the average performing squadron, the peer groups were significantly more similar on the hostile aggression and leadership scales of the ICS measure than in the higher performing squadron. The original design anticipated selecting one squadron in the top quartile and one squadron in the bottom quartile so performance differences between the squadrons could be analyzed. The two squadrons were both in the middle to lower part of the squadron rankings at the beginning of the study. Both squadrons performed well during the school year with squadron H showing exceptional improvement from about the 67th percentile in the squadron rankings at the start of the study to about the 15th percentile at the end of the year. Because only two squadrons out of 40 were used in the study and the selection of the two squadrons was not done at random, the results concerning the relationship between cohesive groups of aggressive cadets and squadron performance cannot be generalized beyond these two squadrons without subsequent validation of the findings in other studies. The finding that the higher performing squadron had less homophily on the aggression and leadership scales is in line with the results of the prior research on the negative impact aggressive individuals and groups can have on performance (Cairns & Cairns, 1994). Further study of the role aggressive peer groups play in squadron performance at military academies is a topic worth pursuing.

The strength of the peer group influences (Table 4.2) and the high stability of the peer groups over the school year (Table 4.1) also emphasize the importance of monitoring cadet peer group formation. Cadet peer groups appear to be creating a consistent environment having the potential to steer their leadership development trajectories. For cadets in positive peer groups, this influence is likely to have a beneficial effect on their leadership

development. Cadets in stable but negative peer groups (groups which detract from the goals of Academy training) may not have the same positive outcomes.

Differences in formal and informal leaders were not as important as the differences between informal leaders and the remaining cadets in the squadron. The formal leaders were not different from other cadets on performance, peer, and centrality measures. This suggests that placing a cadet in a position of leadership does not guarantee the cadet will be seen as a leader by his peers. As Insko and Schopler (1972) point out, there is a difference between being considered a leader by the group and being in a position of leadership. They classify the latter as being in a position of headship while the former is a position of leadership. Even though an individual is put in charge of an organization or project, the individual may not be the same person who is able to exert the most influence on the group.

The results from this portion of the study suggest that commanders may find it more useful to monitor who in the organization is exerting the most influence and not who is in the designated position of leadership. Including the most influential individuals in squadron decision making may be one key to organizational success. In addition, including influential individuals in important squadron decisions and squadron goals could enhance the involvement of other cadets in squadron activities. It is likely that the most influential members of the squadron would be the most likely to be able to motivate other cadets and encourage their involvement in squadron decisions and activities.

The analyses on the differences between formal and informal leadership support the theory that the cognitive construction of leadership in the eyes of peers and cadet supervisors is different from the official position one holds. These findings are similar to the differences Edwards (1994) found in her study on informal versus elective leadership in groups of Girl

Scouts. Future research on leadership development should continue to work on developing a replicable model of the dimensions of leadership that can be used in evaluating leadership outcomes.

In addition, how one is perceived as a leader in the squadron may have a different impact on the leadership development of a cadet than the positions that cadet holds in the squadron. It is possible that cadets who are in a position of authority and are also perceived as a leader by others in the squadron may have the capability to use different bases of power than a cadet in a position of authority who is not respected as a leader by the other cadets in the squadron. How these differences in leadership experience could influence the leadership development of these two cadets is unclear. However, it is possible that the development of a cadet's leadership ability may be influenced as much by the perception of their leadership ability in the eyes of other cadets as by the leadership positions within which they are placed. Continued investigations of the role social influences play in the long-term leadership effectiveness of cadets hold promise as a way to better understand the development of effective leaders.

The prediction of GPA was more accurate from the pre-entry academic composite index than the prediction of MPA from the pre-entry leadership composite index. The low predictability of the MPA may be due to a less valid measure of leadership potential, differences in the ways in which leadership and cognitive ability develop during this period, differences in the types of leadership that are successful in high school versus leadership styles that are better suited to the Academy, or differential amounts of influence environmental factors have on leadership versus academic performance (or any combination of these factors). For example, if a cadet becomes a member of a deviant peer group during

basic training, that peer group may have greater influence on the cadet's subsequent leadership development than on his academic performance. These results highlight the need to ensure that measures of leadership are both developmentally and situationally applicable to the population. In addition, there is no standardized metric on the quality of a cadet's high school leadership experience that is similar to the standardized scoring of an SAT exam. Therefore, while two cadets may both have been student body presidents in high school, such leadership experience may not translate into equivalent leadership potential and may not equally predict future leadership success.

The results of the person-centered analysis were simplified into two clusters because the only significant differences between clusters seemed to depend primarily on differences on hostile aggression. Although the differences between cadets in the hostile and not hostile clusters were not as dramatic as deviant clusters found in school settings (Cairns & Cairns, 1994), the cluster differences in this sample were large enough to suggest that highly aggressive cadets who are struggling in terms of academic and leadership performance may be the most at risk for problems in maintaining appropriate levels of performance. Significant levels of hostile aggression when combined with high competence in academic, military, or athletic performance may not be as detrimental to leadership development as high levels of hostile aggression without such additional competencies.

Applications to Broader Leadership and Social Development Theory

Leadership is a construct that is more than individual personality or specific behavior within a specific context. Certainly, individuals bring their unique history and personality to the organization. However, the manner in which these individual attributes mesh with the culture of the organization and the characteristics of the other individuals within the

organization is the important context in which leadership develops. For example, the aggressive cluster had fewer peer nominations for best leader (23%) and respect (26%) than cadets in the non-aggressive cluster (40% and 47%, respectively). Hostile approaches to leadership may be alienating and isolate leaders from the rest of the social network.

Prior research suggests that (a) aggressive individuals, especially if they are also unpopular or struggling academically, are at higher risk for negative developmental outcomes than other individuals, and that (b) when an individual seeks a new peer group, it is likely that the new peer group will be similar in terms of competency, aggression, and behavior as the old peer group (Cairns & Cairns, 1994). In the current study, propinquity and homophily were found to be strong forces in cadet social groups. These types of findings can inform commanders when making decisions about roommate assignments and squadron jobs for new cadets entering their squadrons. If cadets with a history of probation or disciplinary problems are allowed to affiliate with new peer groups whose cadets have similar deviant behaviors and beliefs, it may be more difficult to encourage changes in behavior than if the cadets are steered toward less aggressive peer groups.

While the relationship between organizational effectiveness and aggression was not directly measured in this study, the results on the relationship between informal leadership status and aggression suggest that in the eyes of the other cadets, hostile aggression is not a characteristic that defines effectiveness in leaders. The ability to relate to the other cadets in the squadron seems to be an important defining characteristic of leadership. Perhaps even more important in the Academy setting is that the social groups with which cadets affiliate may affect both their ability to seek desired leadership positions and their ability to overcome previous patterns of aggression or deviancy. For example, low power cadets in squadrons

with rigid barriers between high power and low power peer groups may be short-changed when it comes to their own leadership development. These low status individuals may get locked out of needed leadership experiences by the power wielders in the squadron.

In addition, the results of this study suggest that holding a position of leadership is not necessarily the same thing as being considered a leader by one's peers. How these differences affect cadet leadership development is not clear. It is possible that a cadet in a leadership position who is also respected as a leader by his peers might experience a different leadership development trajectory than a cadet who is in a leadership position but not respected by his peers. Since the goal of the Academy is not to produce high performing squadrons but to produce junior officers prepared to lead the Air Force into the future, providing equal opportunities for leadership development, in equally demanding and rewarding social ecologies, is an important consideration when designing leadership training for cadets. How squadron social groups interact with cadet opportunities for leadership experience and development should continue to be a focus in future work on leadership development.

It is important to remember that military commanders are likely to be placed in charge of an intact group that has established norms and standard practices. This presents a different set of challenges than an individual placed in charge of a newly formed organization or team. Hughes, Ginnett, & Curphy (1996) suggest that a leader taking over an existing team should examine the team at work to determine if potential problems may need to be corrected or redesigned. However, leaders traditionally monitor the team's skills, knowledge, effort, and strategies. It may be more important to monitor the team's interpersonal processes and interactions. Is there a strong, aggressive "in-group" that calls

most of the shots? Are decisions unilateral and hierarchical or do team members have the opportunity to provide input to the process? How open are peer leaders to the suggestions of others?

The results on aggression, leadership, and social networks discussed thus far should be interpreted in light of recent thinking on the nature of aggression (Cairns, 1999). Aggression has historically been conceptualized in two ways. The first, is a unitary concept of aggression that assumes a fairly stable, underlying, trait-like construct. Typically, this is the definition used when discussing deviant, criminal, or psychotic forms of aggressive behavior. While this unitary concept simplifies the definition and study of aggressive behavior, it does not allow for the age, gender, and context specific manifestations of aggression over ontogeny. The second approach sees aggression as a diverse construct with many levels of expression. For example, the aggression identified in a group of incarcerated young adults who have committed violent crimes is very likely different from the aggression which separates groups of cadets at the Air Force Academy. Additionally, appropriate aggression during basic cadet training may be quite different than appropriate aggression during the academic year.

The aggression measured by the ICS hostile aggression scale used in this study is best seen as only one possible manifestation of aggression. The items on the scale included dimensions of hostility, arguing, yelling, and friendliness. These items suggest that the type of aggression being measured is a pattern of hostile, forceful, and possibly demeaning behaviors used when interacting with others. At times, a given level of hostility may be appropriate in specific military contexts. The elimination of aggression within the squadron is not the goal. Fighter pilots, security police officers, and many other professionals in the

Air Force rely on aggression for their survival. However, these aggressive tendencies can be harmful if they are hostile toward the wrong target (i.e., fellow squadron members) and disrupt normal day-to-day relationships within the unit. The ability to integrate appropriate levels of aggression while reducing hostile actions that alienate a cadet from others in the squadron may have significant consequences in the leadership development of cadets.

As highlighted in the introduction, Burns (1978) proposed that there are two types of leaders. The transactional leader sees people as a means to accomplish an organizational end having positive or negative consequences for everyone involved, whereas transformational leaders seek to appeal to the individual's sense of a higher moral good. Transformational leaders are more likely to be in tune with the relationships and dynamics of the organization and to be better able to balance organizational goals with individual growth.

The results of this study suggest that an understanding of relationships and an ability to work with people are important considerations when followers and peers judge the leadership abilities of those with whom they work. There is also evidence to suggest that these characteristics of informal leaders may be important to individual and organizational success. On measures of performance at the end of the school year, informal leaders had higher GPA's and MPA's than other cadets in the squadron (Table 4.8). In terms of organizational success, the higher intraclass correlations in the lower performing squadron suggests that peer groups with similar levels of aggression within the organization may hinder group performance.

In summary, aggressive, hostile forms of leadership do not emerge as the best style of leadership, especially in a training environment such as the Air Force Academy. Furthermore, the negative effects of hostile forms of aggression may be accentuated if one's

peer group has similar styles of aggression. As mentioned earlier, the results of effective leadership styles should be conditioned on the context in which the study is conducted. These results are specifically aimed toward an environment within which future military leaders are being trained. Environments outside this context may require different styles and approaches to leadership. A fire chief leading the brigade extinguishing a large chemical fire, a police officer directing a hostage release, a platoon leader directing soldiers in combat, or a surgeon running a triage unit may have to rely on different levels and types of aggression in order to save lives, take the hill, or release a captive. However, when all is said and done, the importance of debriefing the scenario and providing a means to reestablish a transformational style of leadership may be critical to long-term morale and effectiveness. This may be the direction for future studies in leadership development.

Study Limitations and Future Directions

As with any research project, there are always things that would make a study better able to address the research questions of interest if certain changes were made to the design, data collection, or data analysis portions of the study. For this study, the first change would be a higher level of participation among the squadron members across the time points. Overall participation was very high with about 90% of both squadrons participating in the study in at least one time point. However, only 27% participated at all three time points. The high overall participation allowed for almost complete data from official records. Unfortunately, the low participation across all the time points did not allow for the tracking of the developmental changes of the majority of the cadets in the two squadrons. Through combining data across time points, 50% or more of the cadets in the two squadrons were

included in many analyses. However, it is quite possible that both at-risk individuals as well as high performing individuals were not represented in the data.

While the low participation rate is understandable given the tremendous demands placed on cadet time, future research could benefit from one of the lessons learned in this study. Before beginning a future study, seeking out the most influential individuals in the squadron and enlisting their assistance in coordinating the research may be one way to increase participation across the time points. Most of the coordination for the present study was accomplished with formal squadron leadership. Establishing a working relationship with the informal influence wielders in the squadron may have increased participation at each time point. Identification of the most influential cadets in each squadron could have been accomplished by spending a day or two in the squadrons observing interactions between cadets or through interviews conducted with cadets early in the study. This increase in participation would be especially important in preventing excessive participant loss in longer-term studies which seek to follow individuals beyond their Academy graduation.

A problem related to small sample sizes in studies conducted at the Air Force Academy is the low numbers of minority and female cadets at the Academy relative to most college settings. Since the percentages of white and male cadets are both over 80%, a sample size of 200 cadets contains approximately 40 cadets who are female or minority. Low participation decreases this number even further. This is an important consideration given prior findings on the relationship between social groups, gender, and behavior. Xie, Cairns, and Cairns (1996) found that peer context had a different interaction with individual characteristics for boys than for girls when predicting teen parenthood. If peer network status has a gender or race interaction with leadership development, the leadership

experiences of males or majority cadets may differ from the leadership experiences for females or minority cadets. In order to adequately study these differences, larger sample sizes would be needed.

Further, larger sample sizes would allow the use of a more diverse set of statistical tools in the analyses. By combining both individual performance information and group performance information, better predications of developmental outcomes may be possible. For example, Xie, Cairns, & Cairns (1996), clustered males and females into homogenous groups, before or during early puberty, and found a higher correlation with teen pregnancy when both the average characteristics of one's peer group and the characteristics of the individual were included in the analysis. This strategy was not possible in the current sample because less than 20% of the subjects had complete data on the individual and the peer level. Also, a larger sample size would allow for structural equation modeling of a leadership measurement model in an attempt to clarify the two-factor construct of leadership with an accurate and testable measure.

Although this study is longitudinal and brings a long neglected methodology to the leadership literature, longer-term studies are needed in order to more adequately investigate the mechanisms of change in leadership development. Data gathered beginning in basic cadet training and following an individual for several years after graduation would be an important addition to future work on the relationships between social groups and leadership development. These data should be supplemented with more intensive data collection on pre-academy life experiences such as parental occupations, specific high school accomplishments, prior military service, and other life-course history variables (Elder, 1996). In addition, the ability to follow a squadron's performance over a longer period of time

would allow for a better understanding of the relationship between social structures, leadership development, and squadron performance. For example, do the highest performing squadrons at the Academy produce the most effective officers after graduation?

Applications to Academy Leadership Training

From its inception, this study was designed around the final goal of providing useful information to commanders, cadets, and other leadership practitioners and providing ways to enhance the leadership training experiences of individuals early in their leadership careers. The data and results of this study provide possible directions and ideas that can give commanders information on both improving the performance of their squadrons and on improving the leadership development opportunities of individual cadets. Although these ideas will be presented as separate, numbered paragraphs, this in no way implies priority or independence. To the contrary, the links between social networks and leadership development cut across many lines and will likely require a multi-faceted approach to intervention and improvement. While these proposals are consistent with the findings, they should be assessed in the context and requirements of a given leadership setting.

1. Propinquity was found to be a strong force in the social bonds cadets form in the squadrons. The Air Force Academy capitalizes on these social forces by conducting most of the leadership training within the squadron. Bringing even more of the leadership training cadets receive to the squadron may increase the effectiveness of leadership training currently conducted outside the squadron. For example, bringing senior officers to the squadron to address specific leadership challenges cadets face in the squadron or conducting leadership coursework in the squadron and not in an academic setting might allow cadets to directly apply leadership lessons to squadron issues. Perhaps more

importantly, by presenting lessons in the squadron, intact peer groups can discuss and apply these lessons within a setting that has relevance to their daily lives.

2. Changes in squadron performance may be enhanced when the peer groups in the squadron share the goals of squadron leadership. For example, the squadron staff of a squadron that was in last place in marching performance may consider additional marching practice as the obvious solution. However, the results of this study would suggest that problems in the social ecology of the squadron may make such practice counter-productive. Cadets wanting to improve may be at odds with those who are opposed to additional practice, further dividing the groups in the squadron. If the group(s) against the practice are influential and/or hostile, practice may not be effective. Before revising squadron policies and practices, time spent improving squadron relationships may improve the chances of successful change.

3. The results of this research suggest that, at least in the training environment of these two squadrons, hostile behavior is not compatible with follower perceptions of leadership effectiveness. While hostile cadets may be able to produce immediate results, the commander needs to ask, "At what cost?" White & Lippitt (as cited in Insko & Schopler, 1972) found that organizations with autocratic leaders had followers who were more productive but also were more dependent on the leader for direction and worked less when the leader was not present. These results suggest that individuals who are overly reliant on hostile forms of leadership and influence may need to learn alternative strategies if they wish to lead cohesive and effective teams during their military career.

4. The cadet class year system is designed to maintain distinctions between the four classes in terms of formal leadership structures. However, instead of a clearly defined

four class system (seniors, juniors, sophomores, and freshmen) there is, in many respects, a two class system (upper-class cadets and freshmen). The chain of command between seniors and juniors or juniors and sophomores is often fuzzy. However, freshman are clearly treated differently from the upper three classes. The results in this study suggest that maintaining distinctions between all four classes is conducive to leadership effectiveness and development. Although both squadrons performed well, the higher performing squadron had fewer across class social bonds and had greater diversity among peer group members within each class. Demming (in Gabor, 1990) in his work on Total Quality suggests that effectiveness is improved when barriers are removed between departments. Diverse work teams across equal levels of power within an organization are key components of effective working groups.

5. One of the purposes of moving cadets to new squadrons after two years is to allow individuals who have struggled in the past to have a new start that is void of the reputation they have developed in their prior unit. Research on veterans returning from World War II suggested that changes in relationships during military service can provide a profound turning point in developmental trajectories across the life course (Elder, 1986). Sampson and Laub (1996) suggest an especially salient component of the ability of aggressive individuals in the World War II cohort to break away from prior trajectories of deviancy was the ability to break social bonds with deviant peers that were providing the impetus for deviant behavior. In their study, they found that overseas assignments provided these men with complete severance from prior deviant social ties which allowed them to form new social relationships with individuals different from themselves. As a result, individuals stationed overseas were more likely to turn away from deviancy than

similar individuals who remained closer to home.

In the context of the Air Force Academy and most civilian and government settings, the ability to separate a deviant individual from his deviant peers by the expanse of an ocean is not possible. However, the commander can work to encourage the aggressive cadet to develop relationships with other cadets who are different from himself, especially in terms of aggressive or deviant behavior. The important point is that the commander cannot assume individuals will naturally gravitate toward diverse peer groups that would enhance leadership development. Left on their own, most individuals will seek like-minded individuals (Cairns & Cairns, 1994). For cadets with a history of disciplinary problems, the result most likely will be a continuation of deviant behavior, not a turning point toward better developmental trajectories.

6. The results of this study suggest that cadets who are members of unstable peer groups have a high potential of moving toward isolation within the peer network and not toward higher centrality. Obviously not all individuals within the organization will be or need to be central in the network. However, a commander can help individuals who are isolated and who might benefit from stronger social bonds by involving them in decision-making, leadership roles, and increased responsibility.

7. The results of the leadership model analysis supported the theory that informal and formal leadership are different facets of the leadership construct. Although a person may be in a position of leadership, another person in the unit may actually be more influential and capable of motivating others in the unit. One way to identify the leaders within the organization is to identify those individuals capable of exerting the most influence on the group (Insko & Schopler, 1972) irrespective of the individuals' official roles in the

squadron. If the commander initiates new policies without the support of the influential people in the squadron, the policies may be more difficult to implement.

Concluding Comments

This study investigated the influence of social networks on the leadership and professional military development of cadets. It was proposed that leadership development is a social process involving the growth of individuals as they move in a given direction toward a specified goal. At an institution such as the United States Air Force Academy, the goal is the training and development of potential Air Force leaders. This training takes place in an inherently social environment, yet studies on the relationship between social influences and leadership development are virtually non-existent. Using a longitudinal design over an academic year (August 1997 to May 1998), the study examined the differences in the composition of cadet social groups and their influence on leadership development in two cadet squadrons. Cadet peer groups, identified using Social Cognitive Map procedures (Cairns, Gariépy, & Kinderman, 1990), were influential and stable components of the cadet squadron social ecology. Cadets nominated as "being a good leader" by their peers were not necessarily the same cadets holding positions of formal leadership. These "informal leaders" performed better on academic and military performance measures than other cadets in the squadron, were more respected than other cadets in the squadron, and were more central in the squadron social network. An exploratory measurement model of leadership suggested that leadership is best measured by both the formal position one holds, as well as, ratings of leadership effectiveness and respect obtained from other cadets in the squadron. Hostile aggression was also related to the degree of respect received from other squadron members and to measures of informal leadership. Cadets who had high ratings of hostile aggression

were less likely to receive peer nominations for being one of the "most respected cadets" in the squadron. They were also less likely to be considered a leader in the squadron. Combined, the results from this study suggest that social relationships within a cadet squadron provide a rich and important context for leadership training. The characteristics of cadet social groups have the potential to influence leadership development trajectories. The suggestions provided to commanders based on these findings will hopefully help commanders to have better ideas on ways to improve the leadership development of cadets.

References

Arbuckle, J. L. (1997). AMOS Demo (Version 3.6) [Computer software]. SmallWaters Corporation: Chicago.

Bass, B. M. (1990). Bass & Stogdill's handbook of leadership: Theory, research, and managerial applications (3rd ed.). New York: Free Press.

Bergman, L. R., & El-Khouri, B. M. (1998). SLIEPNER. A statistical package for pattern-oriented analysis. (Version 2.0) [Computer Software]. Stockholm: Department of Psychology, Stockholm University, Sweden.

Bost K. K., Cielinski, K. L., Newell, W. H., Vaughn, B. E., (1994). Social networks of children attending Head Start from the perspective of the child. Early Childhood Research Quarterly, 9, 441-462.

Browne, M. W. (1984). Asymptotically distribution-free methods for the analysis of covariance structures. British Journal of Mathematical and Statistical Psychology, 37, 62-83.

Burns, J. M. (1978). Leadership. New York: Harper & Row.

Cairns, R. B. (1999). The natural history and developmental functions of aggression. Manuscript in preparation.

Cairns, R. B. & Cairns, B. D. (1994). Lifelines and risks: Pathways of youth in our time. New York: Harvester Wheatshaft.

Cairns, R. B., Cairns, B. D., Neckerman, H. J., Gest, S., & Gariépy, J.-L. (1988). Social networks and aggressive behavior: Peer support or peer rejection? Developmental Psychology, 24, 815-823.

Cairns, R. B., Gariépy, J-L, & Kinderman, T. (1990). Identifying social clusters in natural settings. Unpublished manuscript. University of North Carolina at Chapel Hill, Chapel Hill, NC.

Cairns, R. B., Leung, M-C., Buchanan, L., & Cairns, B. D. (1995). Friendships and social networks in childhood and adolescence: Fluidity, reliability, and interrelations. Child Development, 66, 1330-1345.

Cairns, R. B., Leung, M-C., Gest, S. D. & Cairns, B. D. (1995). A brief method for assessing social development: Structure, reliability, stability, and developmental

validity of the interpersonal competence scale. Behavioral Research and Therapy, 33, 725-736.

Cairns, R. B., Leung, M-C., Gest, S. D., Neckerman, H. J., & Cairns, B. D. (1988). A brief method for the assessment of interpersonal competence (ICS): Notes on reliability, internal consistency, stability, and construct validity. Unpublished manuscript. University of North Carolina at Chapel Hill, Chapel Hill, NC.

Cairns, R. B., & Mahoney, J. L. (1997). Do extracurricular activities protect against early school dropout? Developmental Psychology, 33, 241-253.

Cairns, R. B., Perrin, J. E., & Cairns, B. D. (1985). Social structure and social cognition in early adolescence: Affiliative patterns. Journal of Early Adolescence, 5, 339-355.

Cairns, R., Xie, H., and Leung, M-C. (1998). The popularity of friendships and the neglect of social networks: Toward a new balance. In W. M. Bukowski & A. H. Cillessen (Eds.), Sociometry then and now: Building on six decades of measuring children's experiences with the peer group (pp. 25-54). San Francisco: Jossey Bass.

Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. Psychological Bulletin, 56, 81-105.

Chen, X. (1996, November). Peer relationships and networks and socio-emotional adjustment: A Chinese perspective. Paper presented at the Carolina Consortium on Human Development, Chapel Hill, NC.

Clarke-McLean, J. G. (1996). Social networks among incarcerated juvenile offenders. Social Development, 5, 203-217.

Cohen, J., & Cohen, P. (1975). Applied multiple regression/correlation analysis for the behavioral sciences. Hillsdale, NJ: Erlbaum.

Costanzo, P. R. (1992). External socialization and the development of adaptive individuation and social connection. In D. N. Ruble, P. R. Costanzo, & M. E. Oliveri (Eds.), The social psychology of mental health: Basic mechanisms and applications (pp. 55-80). New York: Guilford Press.

Cunningham, I. (1992). The impact of who leaders are and what they do. In K. E. Clark, M. B. Clark, & D. P. Campbell (Eds.), Impact of leadership. (pp. 249-256). Greensboro, NC: Center for Creative Leadership.

Edwards, C. A. (1994). Leadership in groups of school-age girls. Developmental Psychology, 30, 920-937.

Ekvall, G., & Arvonen, J. (1991). Change centered leadership: An extension of the two dimensional model. Scandinavian Journal of Management, 7. 17-26

Ekvall, G., & Arvonen, J. (1994). Leadership profiles, situation and effectiveness. Creativity and Innovation Management, 3. 139-161.

Elder, G. H., Jr. (1986). Military times and turning points in men's lives. Developmental Psychology, 22, 233-245.

Elder, G. H., Jr. (1996). Human lives in changing societies: Life course and developmental insights. In R. B. Cairns, G. H. Elder, Jr., & E. J. Costello (Eds.), Developmental science (pp. 31-62), Cambridge: Cambridge University Press.

Evans, M. G. (1970). The effects of supervisory behavior on the path-goal relationship. Organizational Behavior and Human Performance, 5. 277-298.

Farmer, T. W., & Cairns, R. B. (1991). Social networks and social status in emotionally disturbed children. Behavioral Disorders, 16, 288-298.

Fiedler, F. E. (1967). A theory of leadership effectiveness. New York: McGraw-Hill.

French, J., & Raven, B. H. (1959). The bases of social power. In D. Cartwright (Ed.), Studies of social power (pp.118-149), Ann Arbor, MI: University of Michigan Press.

Gabor, A. (1990). The man who discovered quality. NY: Random House.

Galton, F. (1978). Hereditary genius: An inquiry into its laws and consequences. London: J. Friedman. (Original work published 1869).

Hall, B. F. (with D. A. Wagie). (1996). The US Air Force Academy's cutting-edge character development program. Air Power Journal [On-line serial], Summer 1996, Available: http://www.cdsar.af.mil.apj.wagie.html.

Hersey, P. & Blanchard, K. H. (1969). Life cycle theory of leadership. Training and Development Journal, 23 (5). 26-34.

Hersey, P. & Blanchard, K. H. (1982). Management of organizational behavior: Utilizing human resources (4th ed.). Englewood Cliffs, NJ: Prentice Hall.

Hogan, R., Curphy, G. J., & Hogan, J. (1994). What we know about leadership: Effectiveness and personality. American Psychologist, 49, 493-504.

Hollander, E. P. (1985). Leadership and power. In G. Lindzey & E. Aronson (Eds.), Handbook of social psychology: Vol. 2. Special fields and applications (3rd ed., pp. 485-537). New York: Random House.

House, R. J. (1971). A path goal theory of leadership effectiveness. Administrative Science Quarterly, 16, 321-338.

House, R. J. & Dessler, G. (1974). The path-goal theory of leadership: Some post-hoc and a priori tests. In, J. G. Hunt & L. L. Larson (Eds.), Contingency approaches to leadership. Carbondale, IL: Southern Illinois University Press.

Hughes, R., Ginnett, R. & Curphy, G. (1996). Leadership: Enhancing the lessons of experience (2nd ed.) Chicago: Irwin.

Insko, C. A., & Schopler, J. (1972). Experimental social psychology: Text with illustrative readings. New York: Academic Press.

Kerr, S., Schriesheim, C. A., Murphy, C. J., & Stogdill, R. M. (1974). Toward a contingency of leadership based upon the consideration and initiating structure literature. Organizational Behavior and Human Performance, 12. 62-82.

Kohlberg, L. (1958). The developmental modes of moral thinking and choice in the years ten to sixteen. Reprinted in B. Puka (Series Ed.), Moral development: Vol. 3: Kohlberg's original study of moral development. (1994). New York: Garland Publishing.

Leung, M-C. (1998). SCM (Version 4.0) [Computer Software]. Chapel Hill, NC: Center for Developmental Science, University of North Carolina at Chapel Hill.

Leung, M-C. (1996). Social networks and self enhancement in Chinese children: A comparison of self reports and peer reports of group membership. Social Development, 5. 146-157.

Magnusson, D. (1988). Individual development in the paths through life: Vol. A longitudinal study. Hillsdale, NJ: Erlbaum.

Magnusson, D. & Bergman, L. R. (1990). A pattern approach to the study of pathways from childhood to adulthood. In L. N. Robins & M. Rutter (Eds.), Straight and devious pathways from childhood to adulthood (pp. 101-115). Cambridge: Cambridge University Press.

Magnusson, D. & Cairns, R. B. (1996). Developmental science: Toward a unified framework. In R. B. Cairns, G. H. Elder, Jr., & E. J. Costello (Eds.), Developmental science (pp. 7-30), Cambridge: Cambridge University Press.

Mann, R. D. (1959). A review of the relationships between personality and performance in small groups. Psychological Bulletin, 56, 241-270.

McNemar, Q. (1962). Psychological Statistics (3rd ed.). New York: Wiley.

Neckerman, H. J. (1992). A longitudinal investigation of the stability and fluidity of social networks and peer relations of children and adolescents. Unpublished doctoral dissertation, University of North Carolina at Chapel Hill.

Neckerman, H. J. (1996). The stability of social groups in childhood and adolescence: The role of the classroom social environment. Social Development, 5. 131-145.

Norusis, M. J. (1994). SPSS: SPSS professional statistics 6.1. Chicago: SPSS Inc. 1994

Nystedt, L. (1997). Who should rule? Does personality matter? European Journal of Personality, 11. 1-14.

Peters, L. H., Hartke, D. D., & Pohlmann, J. T. (1985). Fielder's Contingency theory of leadership: An application of the meta-analytic procedures of Schmidt and Hunter. Psychological Bulletin, 97. 274-285.

Raven, B. H. (1992). A power/interaction model of interpersonal influence: French and Raven thirty years later. Journal of Social Behavior and Personality, 7. 217-244.

Sampson, R. J., & Laub, J. H. (1996). Socioeconomic achievement in the life course of disadvantaged men: Military service as a turning point, circa. 1940-1965. American Sociological Review, 61, 347-367.

Shavelson, R. J. (1988). Statistical reasoning for the behavioral sciences (2nd ed.). Boston: Allyn and Bacon, Inc.

Stattin, H. & Magnusson, D. (1990). Pubertal maturation in female development. Hillsdale, NJ: Erlbaum.

Stogdill, R. M. (1948). Personal factors associated with leadership: A review of the literature. Journal of Psychology, 25. 35-71.

Stogdill, R. M. (1974). Handbook of leadership. New York: Free Press.

Tanaka, J. S., Panter, A. T., Winborne, W. C., & Huba, G. J. (1990). Theory testing in personality and social psychology with structural equation models: A primer in 20 questions. In C. Hendrick & M. S. Clark (Eds.), Review of personality and social psychology: Vol. 11: Research methods in personality and social psychology (pp. 217-242). Newbury Park, CA: Sage.

USAF Academy. (1999). USAF Academy Mission Statement [On-line]. Available: http://www.usafa.af.mil/usafa-mission.html.

USAFA Office of Institutional Research. (1998). Statistical summaries of USAFA cadets and graduates. USAF Academy, CO.

USAFA Office of Institutional Research. (1997). Descriptive characteristics and comparisons for the class of 2001. USAF Academy, CO.

USAFA Office of Institutional Research. (1995). Descriptive characteristics and comparisons for the class of 1999. USAF Academy, CO.

Vecchio, R. P. (1987). Situational leadership theory: An examination of a prescriptive theory. Journal of Applied Psychology, 72. 444-451.

Vroom, V. H. & Yetton, P. W. (1973). Leadership and decision-making. Pittsburgh: University of Pittsburgh Press.

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), Structural equation modeling: Concepts, issues, and applications (pp. 56-75). Thousand Oaks, CA: Sage.

Xie, H. (1998). The development and function of social aggression: A narrative analysis of social exchange in interpersonal conflicts. Unpublished doctoral dissertation, University of North Carolina at Chapel Hill.

Xie, H., Cairns, R. B., & Cairns, B. D. (1996). What predicts teen parenthood: Peer affiliations or individual dispositions? Unpublished manuscript, Center for Developmental Science, University of North Carolina at Chapel Hill, Chapel Hill, NC.

Yukl, G. & Van Fleet, D. D. (1990). Theory and research on leadership in organizations. In M. D. Dunnette & L. M. Hough (Eds.), Handbook of industrial & organizational psychology. 147-197.

Appendix A
Self-Report Survey

Privacy Act Statement

a. Authority:
   1. U.S. Code See 9349, Cadets: organizations; service; instruction.
   2. 10 U.S.C. 8012, Secretary of the Air Force, Powers, Duties, Delegation by Compensation

b. Principle Purposes:
   To investigate the relationship between social influences and leadership. The data will be used in a longitudinal investigation of the stability and influence of social networks. This study is being conducted in partial completion toward the degree of Doctor of Philosophy at the University of North Carolina at Chapel Hill.

c. Routine uses: None.

d. Participation: Voluntary.

Thank you again for choosing to participate in this study! Please answer the following questions as completely as you can. If you are uncomfortable answering a question for any reason, leave it blank. (NOTE: In several places you will be asked to write down first and last names of people in your squadron. This information is requested only to aid in the coding of the data. No information you write down will be given to anyone except to code the data for analysis. Your name and the names of other cadets will not be reported to anyone outside the study. **REMEMBER, YOUR RESPONSES WILL BE KEPT IN COMPLETE CONFIDENCE.)**

First Initial of Your Last Name: ____ Squadron: _____

Last Four Digits of your Social Security Number: _____

For questions 1-23, please circle your answer on this survey and darken the appropriate circle on your answer sheet.

1. Class: a. 1998 b. 1999 c. 2000 d. 2001

2. Age at entry to Academy:
   a. 18 or younger
   b. 19
   c. 20
   d. 21 or older

3. Do you have prior college or enlisted experience?

a. No, I entered the summer I graduated from high school.
b. No, but I waited at least a year from high school.
c. Yes, prior college.
d. Yes, prior enlisted.
e. Yes, prior college and prior enlisted.
f. Other, Please specify:

4. Have you been on any probations while at the Academy (mark all that apply)?

a. No
b. Yes, currently on Academic Probation
c. Yes, currently on Athletic Probation
d. Yes, currently on Conduct and/or Aptitude Probation
e. Yes, currently on Honor Probation
f. Yes, previously on Academic Probation
g. Yes, previously on Athletic Probation
h. Yes, previously on Conduct and/or Aptitude Probation
i. Yes, previously on Honor Probation

5. Do you participate in intercollegiate activities that take you out of the squadron regularly (mark all that apply)?

a. no
b. Intercollegiate athletics with full on-season status at least part of the school year(i.e., football).
c. Intercollegiate athletics with less than full on-season status at least part of the school year(i.e., club sports).
d. Non-athletic participation with full on-season status at least part of the school year (i.e., Drum and Bugle).
e. Non-athletic participation with less than full on-season status at least part of the school year (i.e., debate team).
f. Other, Please specify:

6. Do you currently hold a formal leadership position at USAFA? (We define a formal leadership position is defined as a position officially related to the operations of the cadet wing chain of command requiring you to write one or more performance ratings on other cadets. Do not include non-supervisory jobs, clubs, or off-base activities.)

a. yes b. no

Position: _____

7. Do you hold a leadership position in an activity other than the cadet wing chain of command (clubs, chapel, off-base, etc.)?

a. yes b. no

Position(s):_____

Organization(s): _____

For questions 8-23, please circle the letter on each line where you would rate yourself then darken the appropriate letter for each item on your answer sheet.

8. NEVER ARGUES	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G Sometimes	ALWAYS ARGUES
9. ALWAYS IN TROUBLE	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G Sometimes	NEVER IN TROUBLE
10. ALWAYS SMILES	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G Sometimes	NEVER SMILES
11. WELL RESPECTED	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G So-So	NOT RESPECTED
12. A LEADER	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G So-So	NOT A LEADER
13. NOT ATHLETIC	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G So-So	ATHLETIC
14. LOOKS GOOD IN UNIFORM	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G So-So	DOESN'T LOOK GOOD IN UNIFORM
15. VERY GOOD IN FUZZY STUDIES	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G So-So	NOT VERY GOOD IN FUZZY STUDIES
16. HOSTILE	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G Sometimes	NOT HOSTILE
17. VERY POPULAR	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G So-So	NOT POPULAR
18. MANY FRIENDS	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G Some Friends	NO FRIENDS
19. DISLIKES POLITICS	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G Neutral	LIKES POLITICS
20. NEVER YELLS	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G Sometimes	ALWAYS YELLS
21. WINS A LOT	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G Sometimes	NEVER WINS
22. NOT VERY GOOD IN ENGINEERING	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G So-So	VERY GOOD IN ENGINEERING
23. ALWAYS FRIENDLY	A • • • • B • • • • C • • • • D • • • • E • • • • F • • • • G Sometimes	NEVER FRIENDLY

For the remaining questions, fill in the blanks on the survey. You may use a name once, more than once, or not at all. **Remember, your answers will be kept completely confidential, all names will be recoded to an identification number in order to protect the privacy of each individual.**

24. Please list three people (first and last names) whom you consider to be **the best leaders in your squadron**. (They do not have to hold a formal leadership position as described on pg. 2 in order to be considered leaders.)

1. _____

2. _____

3. _____

25. Please list three people (first and last names) in your squadron whom you think will be **the best leaders after graduation**.

1. _____

2. _____

3. _____

26. Please list three people (first and last names) in your squadron whom you think **best exemplify the core values of USAFA (Integrity - Selflessness - Excellence)**.

1. _____

2. _____

3. _____

27. Please list three people (first and last names) in your squadron whom you think **are the most respected**.

1. _____

2. _____

3. _____

28. Often in a squadron, there are groups of people who hang out together. Please use the boxes below to write the names of people who hang out together (don't forget to include yourself). List as many groups as you can identify. You do not have to fill all the boxes, write down as much as you want. If you run out of boxes, ask the survey administrator for a continuation sheet. If a person is not in your squadron, please identify their squadron (if you know it). **REMEMBER, YOUR ANSWERS WILL BE KEPT COMPLETELY CONFIDENTIAL.**

example: George Washington Thomas Jefferson Betsy Ross Ben Franklin - sqd 41		

29. If you have a group or groups of friends you typically hang out with, who, if anyone, is/are the leader(s)?

30. Some people hang out with big groups, some people hang out with only a few people, and others don't hang out with a particular group. Are there any individuals in your squadron (including yourself) who don't hang out with a particular group?

a. yes b. no

If yes, who in your squadron does not hang out with a particular group?

31. Please list the individual(s) whom you consider to be your closest friend(s) at the Academy.

Element Leaders, Flight Commanders, Adjutants, Operations Officers, and Squadron Commanders please turn in this survey and your answer sheet and pick up Part II from the survey administrator.

If you are **NOT** an Element Leader, Flight Commander, Adjutant, Operations Officer, or Squadron Commander, this is the end of the survey. Thanks for your participation and the use of your valuable time.

Self-Report Survey Questions 1-7 from T_2 Administration:

1. Are you medically qualified for pilot or navigator training?

a. Yes
b. No
c. I don't know

2. Have either or both of your parents served in the military?

a. No
b. Yes, still on active duty
c. Yes, served in the military and left before retirement
d. Yes, served in the military and retired from active duty
e. Yes, served on active duty and now in the Guard or Reserves
f. Yes, is serving or has served in Guard or Reserve but never served on active duty
g. Yes, deceased while serving on active duty
h. Other, Please specify:

3. Have you been on any probations while at the Academy (mark all that apply)?

a. No
b. Yes, currently on Academic Probation
c. Yes, currently on Athletic Probation
d. Yes, currently on Conduct and/or Aptitude Probation
e. Yes, currently on Honor Probation
f. Yes, previously on Academic Probation
g. Yes, previously on Athletic Probation
h. Yes, previously on Conduct and/or Aptitude Probation
i. Yes, previously on Honor Probation

4. Did you receive any of the following awards or recognitions while in high school (mark all that apply)?

a. No
b. National Merit Scholarship semi-finalist or finalist
c. Scholarship offer from ROTC or another college or university
d. National Honor Society member
e. Class Valedictorian or Salutatorian
f. Student Body or Class officer (president, treasurer, etc.)
g. Athletic or Academic Letter (one or more)
h. President or leader of student organization or club
i. Other, please specify:

5. Do you currently hold a formal leadership position at USAFA? (We define a formal leadership position as a position officially related to the operations of the cadet wing chain of command requiring you to write one or more performance

ratings on other cadets. Do not include non-supervisory jobs, clubs, or off-base activities.)

a. yes b. no

Position: _____

6. Do you hold a leadership position in an activity other than the cadet wing chain of command (clubs, chapel, off-base, etc.)?

a. yes b. no

Position(s):_____

Organization(s): _____

7. Do you have prior ROTC experience?

a. No
b. Yes, JROTC in high school
c. Yes, JROTC in high school and one or semesters of ROTC
d. Yes, one or more semesters of ROTC

Self-Report Survey Questions 1-7 from T_3 Administration:

1. What career field do you want to enter upon graduation (i.e., pilot, maintenance officer, doctor, etc.)?

_____

2. Do you have one or more siblings who have served in the military?

a. No
b. Yes, currently on active duty (including prep school & cadet)
c. Yes, served on active duty but now a civilian
d. Yes, served on active duty and now in the Guard or Reserves
e. Yes, is serving or has served in Guard or Reserve but never served on active duty
f. Yes, deceased while serving on active duty
g. Other, please specify:

3. Have you been on any probations while at the Academy (mark all that apply)?

a. No
b. Yes, currently on Academic Probation
c. Yes, currently on Athletic Probation
d. Yes, currently on Conduct and/or Aptitude Probation
e. Yes, currently on Honor Probation
f. Yes, previously on Academic Probation
g. Yes, previously on Athletic Probation
h. Yes, previously on Conduct and/or Aptitude Probation
i. Yes, previously on Honor Probation

4. In which division is your academic major? (If you are undecided, pick your first choice for your planned major.)

a. Basic sciences
b. Engineering
c. Humanities
d. Social sciences
e. I really don't know

5. Do you currently hold a formal leadership position at USAFA? (We define a formal leadership position as a position officially related to the operations of the cadet wing chain of command requiring you to write one or more performance ratings on other cadets. Do not include non-supervisory jobs, clubs, or off-base activities.)

a. yes b. no
Position: _____

6. Do you hold a leadership position in an activity other than the cadet wing chain of command (clubs, chapel, off-base, etc.)?

a. yes b. no
Position(s):_____
Organization(s): _____

7. How well do you think your Academy military training has prepared you for being an officer in the U. S. Military?

a. Extremely well
b. Very well
c. Pretty good
d. So-so
e. Marginally well
f. Not very well
g. Extremely poor

Appendix B
ICS-L Supervisor Rating Cover Letter

Please complete the attached rating scales for each individual in your chain of command. The people you should rate are listed below. We have made every attempt to account for every person in the squadron. However, feel free to fill out additional rating form(s) for any individual(s) we may have overlooked. Your time is valuable, so every effort has been made to keep the rating forms short and meaningful. *Remember: These forms will **NOT** become a part of anyone's record and will not be released to anyone outside of the researchers conducting the study. Please be honest and candid with your ratings.* Your part in this study is a key component of the project and your help is truly appreciated. Thank you.

Element Leaders Rate:

Element NCO
Element Clerk
All Third & fourth Class cadets in your element

Flight Commanders Rate:

Your Element Leaders
Unranked First & Second Class cadets in your flight

Adjutants Rate:

Information Management NCO
Support NCO
UPAR NCO
All other First & Second Class cadets who report directly to you

Operations Officers Rate:

Squadron Commander
Operations NCO
Athletic Officer and NCO
Training Officer and NCO
Academic Officer and NCO
All other First & Second Class cadets who report directly to you

Squadron Commanders Rate:

Operations Officer
Flight Commanders
Stan. Eval. Officer and NCO
Honor Officers and NCOs
Human Relations Officer and NCO
All other First & Second Class cadets who report directly to you

INSTRUCTIONS FOR PART II:

1. Complete one computer answer sheet for each subordinate.

2. **Write the name** of each of your subordinates on a blank computer answer sheet.

2. Using the scale on the back of this page, complete an answer sheet for each subordinate by selecting the letter for each item which most closely describes your subordinate then darkening the appropriate letter on the answer sheet. Do not mark on the attached form, only mark your selections on the computer answer sheet.

3. Complete one answer sheet for each of your subordinates. When you are finished, place your completed answer sheets back in the envelope and return the envelope to your squadron commander. **PLEASE DOUBLE CHECK THAT YOU HAVE WRITTEN THE NAME OF EACH SUBORDINATE ON THE ANSWER SHEET.**

THANK YOU FOR YOUR TIME!

Appendix C
ICS-Leader Factor Analysis

Assessing longitudinal data is an important part of developmental research. Repeated measures in longitudinal designs have many unique problems. One of the more pragmatic concerns of longitudinal data collection is designing instruments which are psychometrically sound yet provide economy of effort on the part of the survey administrator and the research participants (Cairns, Leung, Gest, & Cairns, 1995). Since participants complete instruments on multiple occasions, it is important that the instruments not be too long yet still retain their reliability and validity over the administrations. The ICS measures are both easy to administer and psychometrically robust (Cairns & Cairns, 1994; Cairns, Leung, Gest, & Cairns, 1995; Cairns, Leung, Gest, Neckerman, & Cairns, 1988).

Table C.1 shows a typical factor structure of the original factor analyses of the ICS-T from the Carolina Longitudinal Study (from Cairns et. al., 1995). This table is for one of two cohorts of students in the fourth grade and reports separately for males. Over the course of nine years and the analysis of 30 different measurement points, three consistent and distinct factors emerged in the ICS-T. These factors represent latent constructs of popularity, aggressiveness, and academic ability and are represented by factors 1, 2, and 3, respectively, in Table C.1. The original analyses were done with both principal components analysis and principal axis analysis. The two methods yielded virtually the same factor patterns with the factor loadings slightly lower with the principal axis method. Varimax rotation was used in

all ICS-T analyses. The factor analysis strategy for the ICS-L was designed to replicate this analysis strategy and to look at alternative strategies for the Academy population.

ICS-L Analysis

A four step approach was taken to analyze the ICS-L data and produce a factor structure for ICS-L data. These steps were chosen in order to both replicate the procedures of the ICS-T analysis and to produce a parsimonious solution for the ICS-L data.

1. Examine bivariate relationships and descriptive statistics.
2. Complete a factor analysis on the data using both principal components and principal axis procedures, varimax rotation (replication of Cairns et al., 1995, procedures).
3. Conduct alternative analyses utilizing differing extraction and rotation strategies.
4. Choose a solution that best fits the data and the understanding of cadet behavior.

Step 1: Descriptive and Bivariate Analysis

The correlation matrices for each item are located at the end of this appendix in Table C.6 for T_1, Table C.7 for T_2, and Table C.8 for T_3. All of the correlations at each time point except for politics have significant correlations with more than one other variable. Politics was a filler item and was not expected to correlate with other items. There was a tendency toward positive ratings which was not surprising considering the Academy is a highly selective institution. Since variables in the correlation matrix have a large number of high correlations, a factor model should be appropriate (Norusis, 1994).

Step 2: Replication of ICS-T Analyses

The results of the principle components analyses are located in Tables C.2 to C.4. Varimax rotations with three factors extracted were used to identify the factor structure. The principle axis structure yielded three factors with an eigenvalue greater than one while the

principle components structure yielded four factors. Inspection of the scree plot for the data suggested that three or four factors were a reasonable number of factors. The factor loadings and eigenvalues tended to be higher in the principal component structure but the factor patterns and weights are almost identical. Like the original factor structure in the ICS-T data, the three factor solution was selected.

Although some variation existed in the items loading on the factors at each time point, a consistent pattern of loadings occurred with the original ICS results and the ICS-L results from the three data collection points in this study. Based on these consistent loadings ($\geq$ .40 on the original ICS factor structure and on the ICS-L factor structures), the following items were selected for each factor. For the leadership factor, items used were friends, popular, leader, respect, smiles, and athlete. For the hostile aggression factor, items used were hostility, argues, yells, and friendly. For the academic item, only the item on "good in engineering courses" loaded consistently. Although "friendly" did not load on the original ICS factor loadings, it was included because it did load on the ICS scale at all three time points and it loaded at -.33 on the original scale. It loads negatively on the original ICS-T because on the original scale the aggression items were scaled so that high aggression was coded as a seven and low aggression a one. On the ICS-L, the hostile aggression items are coded in the reverse manner so that a high score on the hostile aggression factor indicates lower levels of aggressive behavior.

Table C.1 : Factor Pattern Matrix for the 15 Item ICS-T (Cairns, et. al., 1995) Using Principal Components, Eigenvalue = 1 criteria, Varimax Rotation

	ICS-T (Original)		
	Factor 1 popular	Factor 2 aggress.	Factor 3 academ.
friends	**0.75**	-0.21	0.23
pop. w/ girls	**0.77**	-0.10	0.23
gets own way	-0.31	-0.27	-0.18
pop. w/ boys	0.71	-0.09	0.13
smiles	0.41	-0.10	**0.50**
wins	0.54	-0.17	**0.41**
gets in fights	-0.03	**0.83**	-0.32
argues	-0.19	**0.87**	-0.08
cries	-0.10	**0.46**	0.28
friendly	0.19	-0.33	**0.43**
trouble	-0.14	**0.84**	-0.31
good looking	**0.77**	-0.14	0.15
good at sports	**0.76**	0.01	-0.08
good at math	0.10	-0.17	**0.78**
good at spell	0.20	-0.33	**0.77**
Eigenvalue	5.92	2.28	1.20

Table C.2 : Factor Pattern Matrix for the 16 Item ICS-L, T_1, Using Principal Components, Three Factors Extracted, Varimax Rotation

	ICS-L (Academy)		
	Factor 1 leader	Factor 2 aggress.	Factor 3 academ.
4. friends	**0.87**	0.14	0.08
10. popular	**0.86**	0.13	0.08
8. leader	**0.79**	0.14	0.31
11. respect	**0.73**	0.31	0.22
12. smiles	**0.63**	**0.45**	-0.29
15. wins	**0.65**	-0.05	-0.01
7. not hostile	0.18	**0.80**	0.14
1. not argues	0.06	**0.82**	0.17
16. not yell	0.01	**0.78**	-0.03
5. friendly	**0.59**	**0.57**	-0.03
13. no trouble	0.15	**0.62**	0.31
14. uniform	0.25	0.35	**0.63**
2. athlete	**0.42**	-0.06	**0.65**
3. engineering	**-0.44**	0.12	**0.60**
6. fuzzy study	0.14	-0.05	**0.46**
9. politic	0.08	0.00	0.19
Eigenvalue	4.41	3.13	1.97

Table C.3 : Factor Pattern Matrix for the 16 Item ICS-L, T_2, Using Principal Components, Three Factors Extracted, Varimax Rotation

	ICS-L (Academy)		
	Factor 1 leader	Factor 2 aggress.	Factor 3 academ.
4. friends	**0.75**	0.03	-0.20
10. popular	**0.79**	0.23	-0.20
8. leader	**0.86**	-0.02	0.36
11. respect	**0.80**	0.09	0.34
12. smiles	**0.49**	**0.42**	**-0.40**
15. wins	0.34	0.28	-0.43
7. not hostile	0.09	**0.89**	0.20
1. not argues	0.11	**0.87**	0.19
16. not yell	-0.06	**0.71**	-0.06
5. friendly	0.34	**0.69**	-0.17
13. no trouble	0.24	0.36	**0.72**
14. uniform	**0.61**	0.21	0.04
2. athlete	**0.66**	0.13	-0.14
3. engineering	-0.09	0.10	**0.64**
6. fuzzy study	0.26	0.01	-0.01
9. politic	0.12	0.29	0.19
Eigenvalue	4.94	2.34	1.70

Table C.4 : Factor Pattern Matrix for the 16 Item ICS-L, T_3, Using Principal Components, Three Factors Extracted, Varimax Rotation

	ICS-L (Academy)		
	Factor 1 leader	Factor 2 aggress.	Factor 3 academ.
4. friends	**0.80**	0.19	-0.20
10. popular	**0.86**	0.08	-0.13
8. leader	**0.80**	0.04	0.24
11. respect	**0.83**	0.21	0.27
12. smiles	**0.66**	0.08	0.01
15. wins	**0.77**	0.10	-0.13
7. not hostile	0.22	**0.79**	0.05
1. not argues	0.21	**0.73**	0.17
16. not yell	0.04	**0.80**	-0.08
5. friendly	**0.60**	**0.52**	-0.05
13. no trouble	0.29	**0.45**	**0.46**
14. uniform	0.29	**0.43**	0.34
2. athlete	**0.73**	0.08	-0.20
3. engineering	-0.13	0.00	**0.82**
6. fuzzy study	0.19	0.06	**-0.61**
9. politic	0.13	**-0.43**	0.23
Eigenvalue	5.71	2.16	1.55

Notes: Factor loadings in bold indicate items with factor loadings of .40 and greater. Factor loadings in gray boxes are the factors selected for all ICS L analyses in this study.

As a cross-check of the validity of the ICS scales, the three factors were correlated across the three time points in the study. Correlations of the same construct measured at each time point should be high (test - retest reliability) while correlations of different factors at and between each time point should be lower (discriminant validity) (Campbell & Fiske, 1959). Table C.5 compares the three ICS factor correlations across all three time points.

The correlations with fall semester factors and end of the year factors were smaller than the correlations between the two fall collection points. However, it is not possible to determine if these changes in correlations were due to different raters at each time point, developmental changes in raters or ratees, or a combination of both.

The correlations in between the T_1 and T_2 measurements on the same factors (i.e., T_1 academics to T_2 academics) are all significantly different from zero. In addition, Campbell and Fiske (1959) recommend that these values should be higher than the values in their row and column as a measure of its ability to discriminate from other items. All of the factors scores have higher reliabilites with the same factor over the two measurement points than with other factors. Ideally, the items in the correlation matrix other than those correlating the same factor over time should be nonsignificant and small. This is generally true with the exception of T_1 leadership and T_1 aggression and T_3 leadership and T_3 aggression which are highly correlated. Overall, the factor structure of the ICS-L shows reasonable reliability and discriminant validity over the measurement points.

Table C.5: Factor Correlation Matrix Across All Three Time Points

	1	2	3	4	5	6	7	8	9
1. Time One Academic	1.00 (111)								
2. Time One Aggression	.011 (111)	1.00 (111)							
3. Time One Leadership	-.164 (111)	.453*** (111)	1.00 (111)						
4. Time Two Academic	.778*** (45)	.150 (45)	.006 (45)	1.00 (60)					
5. Time Two Aggression	.012 (45)	.637*** (45)	.251 (45)	.093 (59)	1.00 (66)				
6. Time Two Leadership	-.174 (45)	.070 (45)	.663*** (45)	-.051 (60)	.223 (66)	1.00 (67)			
7. Time Three Academic	.327*** (64)	.098 (64)	-.207 (64)	.518*** (38)	-.181 (43)	-.213 (43)	1.00 (118)		
8. Time Three Aggression	.258* (67)	.171 (67)	.078 (67)	.049 (38)	.257 (43)	-.071 (43)	.015 (118)	1.00 (122)	
9. Time Three Leadership	.140 (67)	.129 (67)	.348** (67)	.023 (38)	.214 (43)	.541*** (43)	-.094 (118)	.453*** (122)	1.00 (122)
Mean	4.11	5.19	4.84	4.32	5.64	4.96	4.12	5.45	4.77
Standard Dev.	1.26	1.13	1.07	1.19	1.08	1.03	1.37	1.13	1.18

Note: Valid n for each correlation is in parenthesis. Mean and standard deviations are for the valid n reported on the diagonal.
*$p < .05$. **$p < .01$. ***$p < .001$.

Step 3: Alternative Strategies

In addition to the principal axis and principal components replications of the original ICS factor structure, several alternative factor analyses were conducted including a five factor solution, a maximum likelihood extraction, and oblimin and quartermax rotations. In all the solutions, the factor pattern structure remained consistent with slight changes in the individual item loadings.

Step 4: Selection of a Parsimonious Solution

Three factors appear to be the best number to adequately describe the data and the varimax rotation provides good identification of the factor structure. A fall ICS score was created for cadets participating at time one and/or time two. Cadets who participated at both time points had their factor scores averaged and cadets who participated at only one time point were given the factor score from that time point. By combining the time one and time two data, the number of cadets who had a fall ICS score on the three factors totaled 125. Of these, 45 cadets had data from both time points, 66 cadets had data from time one only, and 14 cadets had data from time two only.

Table C.6: Correlation Matrix of the ICS-L variables, T_1 (n = 113).

	1	2	3	4	5	6	7	8	9	10
1. not argues	1.00									
2. athlete	0.04	1.00								
3. engineering	0.06	0.09	1.00							
4. friends	0.15	0.42	-0.23	1.00						
5. friendly	0.47	0.18	-0.13	0.55	1.00					
6. fuzzy study	-0.04	0.25	0.10	0.13	***0.20***	1.00				
7. not hostile	0.55	0.09	0.08	0.29	0.58	0.14	1.00			
8. leader	***0.23***	0.43	-0.15	0.66	0.50	0.15	0.29	1.00		
9. politic	-0.04	0.16	0.07	0.01	0.06	***-0.20***	0.09	0.10	1.00	
10. popular	0.12	0.40	***-0.20***	0.89	0.52	0.16	0.25	0.65	0.04	1.00
11. respect	0.34	0.31	-0.08	0.64	0.54	0.10	0.39	0.75	0.09	0.64
12. smiles	0.37	0.07	-0.31	0.55	0.67	0.11	0.38	0.40	-0.10	0.61
13. no trouble	0.52	***0.20***	0.11	***0.23***	0.31	0.06	0.47	0.30	-0.04	***0.19***
14. uniform	0.28	0.39	0.12	0.27	0.29	0.31	0.37	0.44	0.03	0.27
15. wins	0.04	0.25	-0.32	0.45	0.36	0.08	0.14	0.44	0.03	0.39
16. not yell	0.50	0.09	0.01	***0.19***	0.38	-0.06	0.59	0.04	0.05	***0.20***
Mean	5.07	4.85	4.11	4.81	5.19	4.51	5.34	4.87	3.90	4.73
Std. Dev.	1.61	1.66	1.31	1.28	1.26	1.16	1.42	1.36	0.57	1.25

	11	12	13	14	15	16
11. respect	1.00					
12. smiles	0.52	1.00				
13. no trouble	0.40	***0.24***	1.00			
14. uniform	0.40	0.18	0.41	1.00		
15. wins	0.38	0.26	***0.20***	0.16	1.00	
16. not yell	0.12	0.30	0.35	0.26	-0.06	1.00
Mean	4.89	4.83	5.19	4.94	4.65	5.19
Std. Dev.	1.37	1.37	1.60	1.55	1.03	1.33

Notes. Mean is based on a seven point scale with 1 being a negative behavior and 7 being a positive behavior. Correlations highlighted by gray boxes are significant at the .01 level. Correlations in bold, italic print are significant at the .05 level.

Table C.7: Correlation Matrix of the ICS-L variables, T_2, (n =67[a]).

	1	2	3	4	5	6	7	8	9	10
1. not argues	1.00									
2. athlete	.13	1.00								
3. engineering	.11	-.06	1.00							
4. friends	.00	.52	.02	1.00						
5. friendly	.53	.13	-.04	.10	1.00					
6. fuzzy study	-.87	.20	.02	.22	.22	1.00				
7. not hostile	.77	.07	.14	.01	.64	.12	1.00			
8. leader	.08	.48	.07	.52	.15	.22	.12	1.00		
9. politic	.22	.17	.17	.13	.13	***.30***	.39	.13	1.00	
10. popular	.22	.65	-.07	.73	***.24***	.09	.14	.57	.11	1.00
11. respect	.17	.42	-.01	.40	***.25***	.20	.22	.88	.08	.55
12. smiles	.24	.36	-.18	.34	.58	.03	***.29***	.21	.21	.44
13. no trouble	.49	-.01	.34	.02	.23	-.01	.44	.38	.15	.02
14. uniform	***.27***	***.31***	-.10	***.30***	.35	.11	.20	.51	.11	.38
15. wins	.19	.16	-.20	.33	***.28***	.07	.09	***.26***	-.07	.35
16. not yell	.59	.18	.09	-.07	.36	.06	.54	-.11	.01	.10
Mean	5.24	5.42	4.32	4.99	5.52	4.72	5.87	4.88	3.86	4.72
Std. Dev.	1.54	1.58	1.19	1.05	1.28	1.40	1.19	1.51	.93	1.26

	11	12	13	14	15	16
11. respect	1.00					
12. smiles	.24	1.00				
13. no trouble	.44	.06	1.00			
14. uniform	.46	.32	.23	1.00		
15. wins	***.27***	***.28***	.02	***.26***	1.00	
16. not yell	-.08	.20	.19	.06	.07	1.00
Mean	4.81	4.94	5.61	5.18	4.97	5.90
Std. Dev.	1.44	1.29	1.47	1.34	1.09	1.20

Notes. Mean is based on a seven point scale with 1 being a negative behavior and 7 being a positive behavior. Correlations highlighted by gray boxes are significant at the .01 level. Correlations in bold, italic print are significant at the .05 level.

[a]n = 67 for all varaibles except engineering and fuzzy studies (n = 60), friendly and politic (n = 66).

Table C.8: Correlation Matrix of the ICS-L variables, T_3 (n = 122[a]).

	1	2	3	4	5	6	7	8	9	10
1. not argues	1.00									
2. athlete	***.23***	1.00								
3. engineering	.07	-.16	1.00							
4. friends	.25	.62	***-.19***	1.00						
5. friendly	.40	.40	-.11	.49	1.00					
6. fuzzy study	.02	.10	-.50	.14	.14	1.00				
7. not hostile	.59	.24	.04	.33	.52	.03	1.00			
8. leader	.35	.47	.04	.57	.45	.15	***.23***	1.00		
9. politic	-.18	-.08	.06	-.03	-.10	.07	-.11	***.19***	1.00	
10. popular	.17	.63	-.14	.78	.58	.12	.16	.55	-.02	1.00
11. respect	.37	.47	.02	.59	.57	.05	.34	.75	.00	.63
12. smiles	.13	.39	-.05	.46	.54	.07	***.22***	.42	.10	.56
13. no trouble	.43	.11	.15	.11	.33	.01	.32	.33	-.06	***.20***
14. uniform	.29	.10	.15	.13	.31	.07	.27	.26	-.12	***.18***
15. wins	***.22***	.64	-.17	.61	.46	.14	***.23***	.52	-.09	.61
16. not yell	.45	.13	.03	.33	.43	.01	.56	.03	***-.19***	***.19***
Mean	5.28	5.12	4.12	4.94	5.54	4.57	5.49	4.44	3.84	4.72
Std. Dev.	1.67	1.52	1.37	1.24	1.25	1.20	1.43	1.68	1.35	1.47

	11	12	13	14	15	16
11. respect	1.00					
12. smiles	.46	1.00				
13. no trouble	.51	.24	1.00			
14. uniform	.41	.12	.38	1.00		
15. wins	.57	.40	.24	.18	1.00	
16. not yell	.11	***.18***	***.23***	.17	.11	1.00
Mean	4.68	4.71	5.33	5.02	4.82	5.48
Std. Dev.	1.59	1.40	1.66	1.62	1.08	1.42

Notes. Mean is based on a seven point scale with 1 being a negative behavior and 7 being a positive behavior. Correlations highlighted by gray boxes are significant at the .01 level. Correlations in bold, italic print are significant at the .05 level.

[a]n = 122 except engineering, fuzzy studies, and politics (n = 118).

Appendix D
Official Record Variables Used in The Analysis or Data Coding

1. Class year of the participant.
2. Last four digits of Cadet's social security number (used for data coding only).
3. Full name in Academy official records (used for data coding only).
4. Cadet's gender.
5. Cadet's ethnic background
6. Attrition code indicating the reason a cadet left the Academy.
7. Date of departure for cadet's resignation or expulsion from the Academy.
8. Cadet's current squadron.
9. Cadet's current duty status at the end of the spring semester 1998.
10. Cadet's participation in intercollegiate athletics.
11. Prior service experience.
12. Cadet's birth date.
13. The date the cadet graduated from high school.
14. Number of students in the cadet's graduating class.
15. High school graduation order of merit for the cadet.
16. Cadet's academic major.
17. Cadet's military performance average at the end of basic cadet training.
18. Academic Composite Index (ACI) based upon equations combining college aptitude and achievement test scores (ACT or SAT) with the cadet's graduating rank from high school (adjusted for class size and enrollment in advanced course work).
19. Leadership Composite is a combination of athletic (based on participation in high school athletics) and nonathletic (based on leadership positions held in high school) indices.
20. Weighted Composite Index is a combination of academic aptitude, physical fitness proficiency, and high school leadership activity.
21. The merit lists a cadet was awarded at each time point.
22. Cadet's GPA for each time point.
23. Cadet's MPA (military performance average) for each time point.
24. Cadet's cumulative GPA through the spring semester 1998.
25. Cadet's cumulative MPA through the spring semester 1998.
26. Cadet's cumulative PEA (physical education average) through the spring semester 1998.
27. Academic probation each time point.
28. Cadet's official job or position in the Cadet Wing each time point.
29. Probation status for honor, athletic, or aptitude each time point.

Appendix E
Survey Instructions

Group Administration Directions

Your Squadron has been randomly selected to participate in a research study on professional development. We appreciate your help with this project. We have made every effort to streamline this survey to minimize the impact on your time. Please come to the front of the room and pick up Part I of the survey and a blank computer answer sheet.

1. On the computer answer sheet, please darken the last four of your social security number in the last four boxes marked social security number and the first letter of your last name in the first box under last name.

2. There are two copies of an informed consent letter attached to your survey. Carefully read the letter. Tear off the top copy to keep for your records then sign and date the second copy. Leave the signed copy attached to your survey.

3. Complete the survey by marking your answers directly on the survey and transferring the appropriate answers to the computer answer sheet.

4. When finished, double check that you have transferred your answers to the computer score sheet and that you have ***DARKENED IN THE LAST FOUR OF YOUR SOCIAL SECURITY NUMBER AND THE FIRST LETTER OF YOUR LAST NAME.***

When you have finished Part I:

Element Leaders, Flight Commanders, Adjutants, Operations Officers, and Squadron Commanders please turn in this survey and your answer sheet and pick up Part II and new computer answer sheets from the survey administrator. When you have finished Part II, you are done.

If you are **NOT** an Element Leader, Flight Commander, Adjutant, Operations Officer, or Squadron Commander, this is the end of the survey. Turn in your answer sheet and your survey to the survey administrator.

Thanks for your participation and the use of your valuable time!

Mailed Survey Directions

Your Squadron recently participated in a survey on leadership and moral development during the week of _____. You have received this package because you did not attend the group administration or you were at the group administration and your answer sheet was either miscoded or scanned improperly and we do not have your data.

Please take the time to complete this survey and return it in the enclosed envelope. There are two parts to the survey. Part I should be on top with one blue bubble sheet attached. Part I of the survey is to be completed by everyone. If you are **NOT** a Firstie, you will only have Part I of the survey in your package and you are finished when you have completed Part I. **FOR FIRSTIES:** Once you are finished with Part I, review the information below to see if you need to complete Part II. We would like to have data based on your experiences early in the semester so please complete the survey as soon as possible. Thank you for your cooperation and time.

Directions

1. On the blue bubble sheet, please darken the last four of your social security number in the last four boxes marked social security number and the first letter of your last name in the first box under last name. *This step is important because we cannot use your valuable input without this information.* We do not need you to fill in your full name, full SSN, or other identifying information on the digitek. **Please do this now, before beginning the survey**.

2. There are two copies of an informed consent letter attached to Part I of the survey. Carefully read the letter. Keep the copy marked "Participant's Copy". Sign and date the second copy. Please print your name under your signature. Place the signed copy in the envelope addressed to XPR.

3. Complete the survey by marking your answers directly on the survey. Transfer your answers to the corresponding question on the bubble sheet. Make sure you have correctly transferred your answers.

4. Make sure that you have **darkened in the last four of your social security number and the first letter of your last name.** If you do not need to complete part II (see below), you are finished. Place all forms and digiteks in the envelope marked addressed to HQ USAFA/XPR and put the envelope in cadet distribution. Make sure you keep your copy of the consent letter for your records. Thank you.

PART II: Element Leaders, Flight Commanders, Adjutants, Operations Officers, and Squadron Commanders please complete Part II. Part II consists of an instruction sheet with a rating scale on the back and several blue bubble sheets. You will be completing a short rating scale for each of the people you supervise. Follow the enclosed directions for completing Part II then place all forms except for your copy of the informed consent letter in the envelope addressed to HQ USAFA/XPR and put the envelope in cadet distribution. Please make sure you write but do not darken the circles for the last name of each person you rate.

Thanks for your participation and the use of your valuable time.

Appendix F
Intraclass Correlations

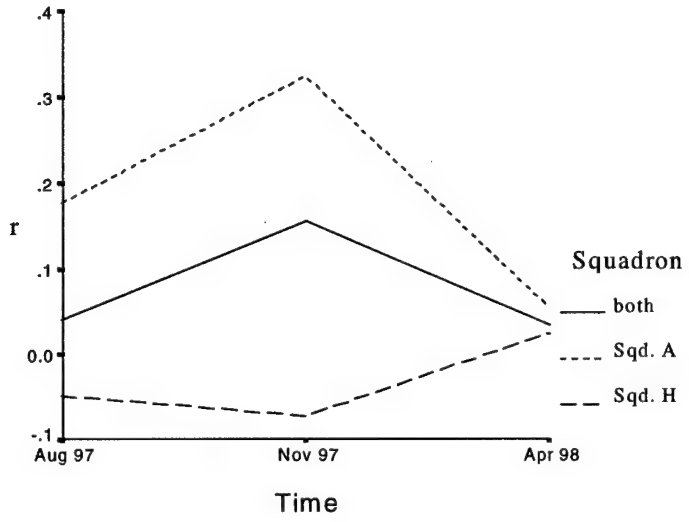
Intraclass correlations were computed on a total of thirteen variables from four different categories. The first category consisted of four dependent variables based on performance scores computed prior to the cadet's entry into the squadron. Three of these variables were composite indices computed by the Academy from pre-entry data in the cadets' official records. These indices serve as predictors of cadet success in different areas at the Academy. The Academic Composite Index is based upon equations combining ACT or SAT scores with the high school graduating rank (adjusted for class size and advanced courses). The ACI is considered a good predictor of overall GPA. The Leadership Composite Index is a combination of athletic (based on participation in high school athletics) and nonathletic (based on leadership positions held in high school) measures. It is used as a predictor of overall leadership potential. The Weighted Composite Index is a combination of academic aptitude, physical fitness proficiency, and high school leadership activity. It is considered an overall evaluation of cadet potential. The final variable in this category was the military performance average (MPA) of each cadet based on their performance in basic cadet training. The MPA is similar to a grade point average and is on a 0.0 to 4.0 scale. The MPA at the end of basic cadet training is a measure of a cadet's performance during basic cadet training. The freshman class was not included in the intraclass correlation analysis for basic cadet training MPA's because they were not given an MPA at the end of their basic cadet training. Figures F.1 to F.4 show the results of these analyses.

The second category of analysis contained one variable. This variable was the cadet's high school graduation class size. This variable was analyzed to see if cadets might affiliate based on prior experience in large or small network settings (i.e., large or small high school classes). It was hypothesized that cadet groups would not have high intraclass correlations on this variable. These results are shown in Figure F.5. The third category of variables used the ICS-L scores for academics, leadership and hostile aggression. The results from the intraclass correlation analysis for the three ICS-L factors are presented in Figures F.6 to F.8.

The final category with five variables were performance averages obtained from official cadet records. The first two variables were the grade point average (GPA) and military performance average (MPA) from each time point. For T_1, the cadet's GPA and MPA at the beginning of the fall 1997 semester were used; for T_2, the GPA and MPA from the end of the fall semester 1997 were used; and for T_3, the GPA and MPA for the end of the spring 1998 semester were used. Because freshman did not have a GPA or MPA at the beginning of the school year, they were not included in the T_1 analysis. The results for GPA and MPA intraclass correlations are shown in Figures F.9 and F.10.

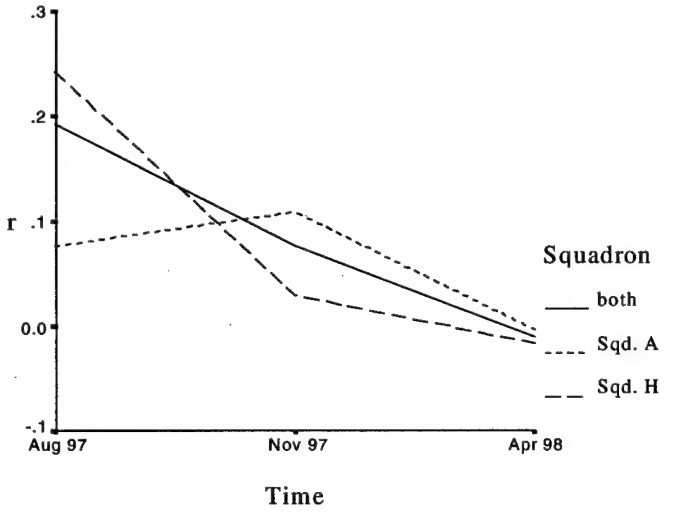
The last three variables in this category were the cumulative performance averages at the end of the school year (May 1998). In addition to a cumulative GPA and MPA, a cumulative physical education average (PEA) based on fitness testing and physical education class grading was available. Since these cumulative averages were computed at the end of the school year, intraclass correlations for SCM groups at time three were used in this analysis. The results of this analysis are shown in Figure F.11. The actual intraclass correlations and significance levels for all the variables are in Table F.1.

Figure F.1: Intraclass Correlations for Academic Composite Index



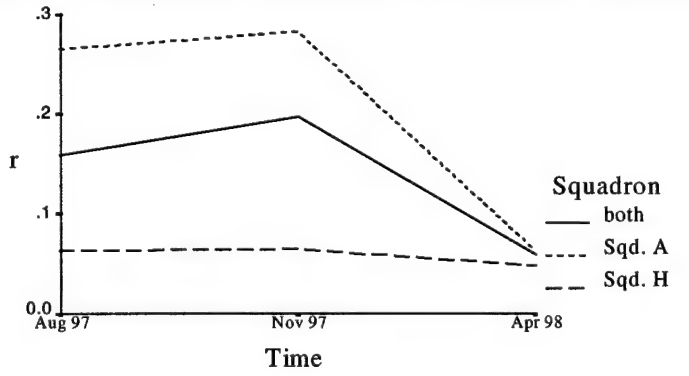
Academic Composite Index is based upon equations combining ACT or SAT scores with the high school graduating rank (adjusted for class size and advanced courses). The ACI is considered a good predictor of overall GPA.

Figure F.2: Intraclass Correlations for Leadership Composite Index



Leadership Composite Index is a combination of athletic (based on participation in high school athletics) and nonathletic (based on leadership positions held in high school) indices. It is used as a predictor of overall leadership potential.

Figure F.3: Intraclass Correlations for Weighted Composite Index



Weighted Composite Index is a combination of academic aptitude, physical proficiency, and high school leadership activity. Is considered an overall evaluation of cadet potential.

Figure F.4: Intraclass Correlations for Military Performance Averages at the End of Basic Cadet Training

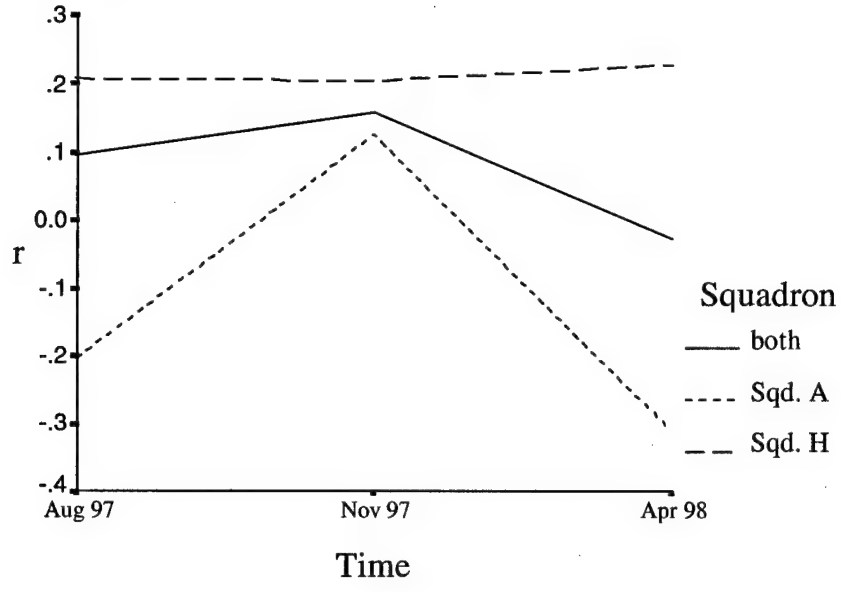


Figure F.5: Intraclass Correlations for High School Graduation Class Size

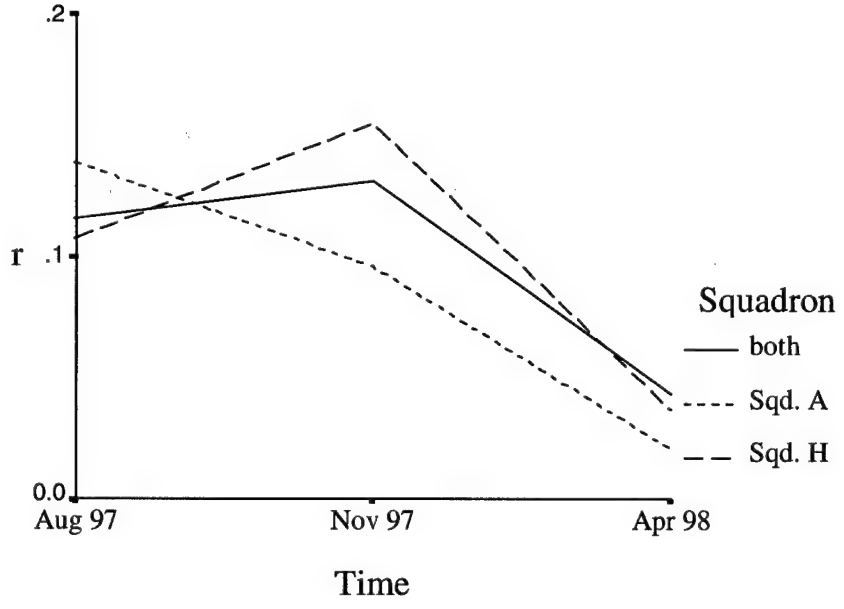


Figure F.6: Intraclass Correlations for Interpersonal Competence Scale - Academics Measured During the Fall Semester

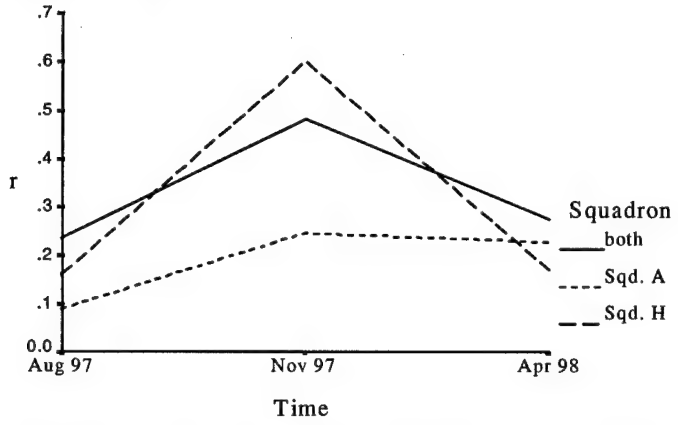


Figure F.7: Intraclass Correlations for Interpersonal Competence Scale - Hostile Aggression Measured During the Fall Semester

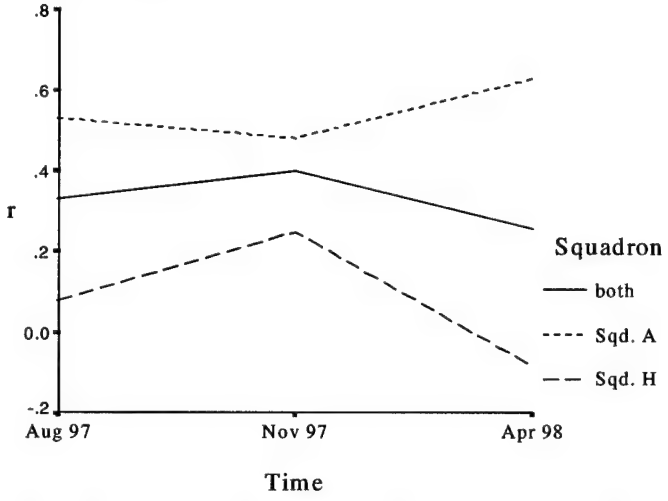


Figure F.8: Intraclass Correlations for Interpersonal Competence Scale - Leadership Measured During the Fall Semester

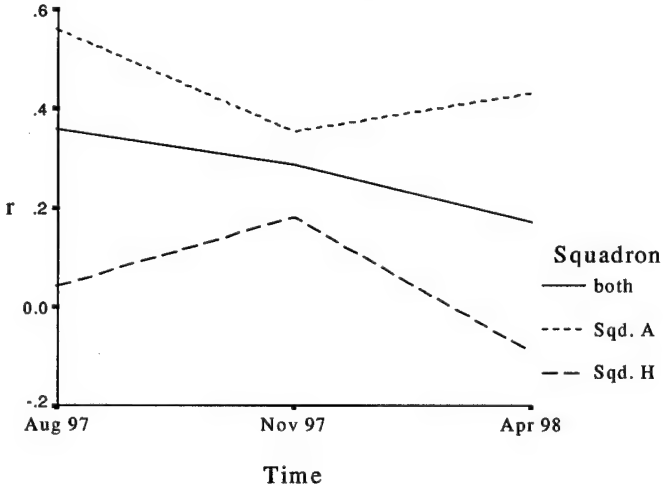


Figure F.9: Intraclass Correlations for Grade Point Average at Time of Data Collection

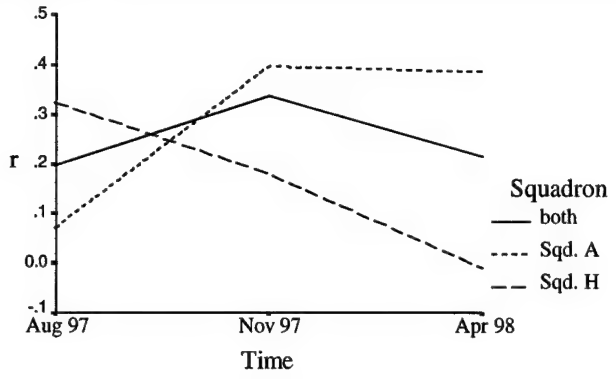


Figure F.10: Intraclass Correlations for Military Performance Average at time of Data Collection

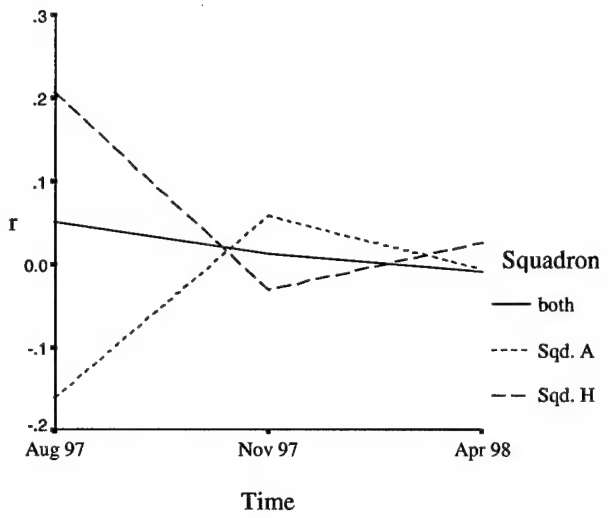


Figure F.11: Intraclass Correlations for Cumulative Performance Averages using April 1998 SCM Groups and end of the School Year (May 1998) Averages

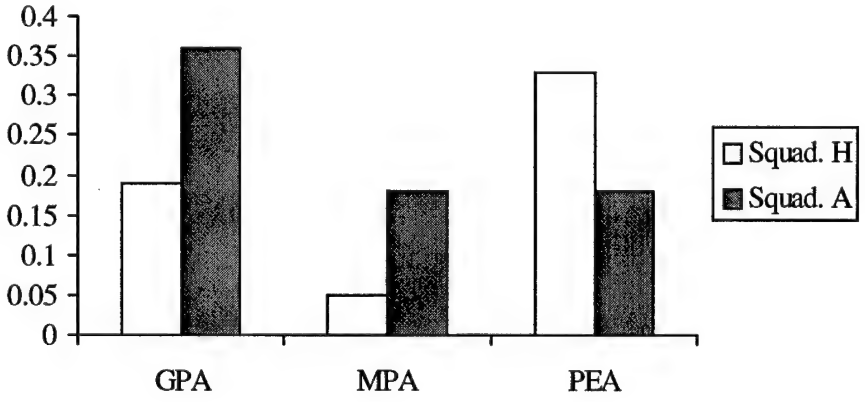


Table F.1: Intraclass Correlations for SCM Identified Groups in Both Squadrons at all Time Points

	Squadron A			Squadron H		
	Aug 97	Nov 97	Apr 98	Aug 97	Nov 97	Apr 98
Academic Composite Index	.18	.33***	.06	-.05	-.07	.03
Leadership Composite Index	.08	.11	.00	.24**	.03	-.02
Weighted Composite Index	.27*	.28***	.06	.06	.07	.05
Basic cadet training MPA	-.20	.13	-.31	.21*	.20*	.23**
High School Class Size	.14	.10	.02	.11	.16	.04
ICS-L- Academics	.09	.25**	.23*	.16	.60***	.17
ICS-L - Hostile Aggression	.53***	.48***	.63***	.08	.25	-.08
ICS-L- Leadership	.56***	.35***	.43***	.04	.18	-.09
Current GPA	.07	.40***	.39***	.32**	.18*	-.01
Current MPA	-.16	.06	-.01	.21*	-.03	.03
Cumulative GPA	n/a	n/a	.36***	n/a	n/a	.19**
Cumulative MPA	n/a	n/a	.18*	n/a	n/a	.05
Cumulative PEA	n/a	n/a	.18*	n/a	n/a	.33***

**$p < .01$. *$p < .05$. +$p < .10$.

Squadron H had lower intraclass correlations overall than squadron A. This suggests that in the higher performing squadron there is less variance accounted for by peer group membership than in the lower performing squadron. This was especially true for the ICS-L variables. Only one of the intraclass correlations for the ICS-L factors was not significant for the low performing squadron (ICS-L for academics at time one) whereas only one of the ICS-L intraclass correlations was significant for the high performing squadron (ICS-L for Academics at time two). However, performance indices based on official cadet records (composite indices, performance averages) were less likely to show differences between the squadrons than measures based on cadet peer leadership ratings (ICS-L factors).

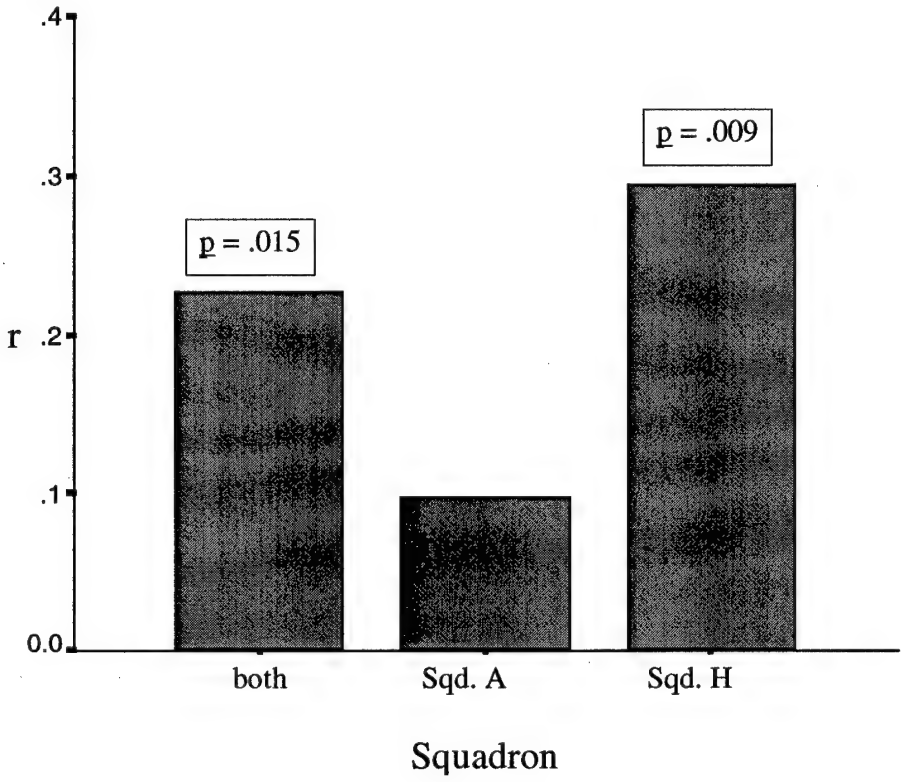
The three composite variables based on pre-entry data (academic composite, leadership composite, and weighted composite) show a converging and generally declining pattern of intraclass correlations over the school year. At the beginning of the school year, the two squadrons had very different intraclass correlations on the three variables, but at the end of the year, both squadrons had non-significant and very similar intraclass correlations. This suggests that over the school year, pre-Academy factors may become less salient in group identity. Basic cadet training MPA did not show the same trend. Cadets in the high performing squadron stayed at a constant and significant intraclass correlation. With the exception of both squadrons at time two where the correlation is marginally significant ($r = .13$, $p = .06$), the intraclass correlations for high school class size are nonsignificant.

With the exception of the academic factor at time point two, the high performing squadron has low and nonsignificant intraclass correlations for all the ICS-L factors at all the time points. The low performing squadron, on the other hand, has significant intraclass correlations at all time points except academics at time one. For grade point average, the

high performing squadron shows a decreasing trend in intraclass correlations over the school year whereas the low performing squadron shows an increasing trend toward significant intraclass correlations. For military performance average, the high performing squadron has a marginally significant intraclass correlation at time one ($r = .21$, $p = .07$). At the remaining time points, both squadrons have intraclass correlations close to zero.

Intraclass correlations were computed based on an attitude question asked at time three. This question asked "How well do you think your Academy military training has prepared you for being an officer in the U. S. Military?" Cadets answered on a seven point scale ranging from extremely well (7) to extremely poor(1). Figure F.12 shows that the high performing squadron had a significant intraclass correlation ($r = .30$, $p = .009$) concerning attitudes toward the effectiveness of Academy training while the intraclass correlation for the low performing squadron was nonsignificant ($r = .10$, $p = .30$). This is the opposite direction of the effect found for the performance and ability variables. This suggests that within the lower squadron, groups are more distinguishable by their abilities than by their attitudes whereas in the high performing squadron groups are more distinguishable by their attitudes than by their performance.

Figure F.12: Intraclass Correlations for Attitude Question of "How well do you think your Academy military training has prepared you for being an officer in the U. S. Military?" using April 1998 (end of school year) SCM Groups.



Appendix G
Chi Square Tables For Cadets Participating in Outside the Squadron Activity

Table G.1: Proportion of Cadets Involved in Outside the Squadron Activity Who Have a Peer Group with at Least One Member from Outside the Squadron.

	Not in a Group with Outside Members	In a Group with Outside Members	Total
T_1 - August 1997			
Not Involved in Outside Activities	78 (.58)	31 (.60)	109
Involved in Outside Activities	55 (.42)	21 (.40)	76
Total	133	52	185
T_2 - November 1997			
Not Involved in Outside Activities	94 (.58)	15 (.63)	109
Involved in Outside Activities	67 (.42)	9 (.37)	76
Total	161	24	185
T_3 - April 1998			
Not Involved in Outside Activities	75 (.64)	34 (.53)	109
Involved in Outside Activities	42 (.36)	30 (.47)	72
Total	117	64	181

Note: Total is lower at T_3 reflecting cadets who left the Academy between T_3 and T_2.

T_1: χ^2 (1) = .007, p = .934.
T_2: χ^2 (1) = .129, p = .720.
T_3: χ^2 (1) = 2.38, p = .123.

Table G.2: Number of Cadets Involved in Outside the Squadron Activity Who are Central or Not Central in the Squadron Social Network.

	Not Central	Central	Total
T_1 - August 1997			
Not Involved in Outside Activities	65 (.61)	44 (.56)	109
Involved in Outside Activities	41 (.39)	35 (.44)	76
Total	106	79	185
T_2 - November 1997			
Not Involved in Outside Activities	53 (.56)	56 (.62)	109
Involved in Outside Activities	42 (.44)	34 (.38)	76
Total	95	90	185
T_3 - April 1998			
Not Involved in Outside Activities	59 (.59)	50 (.62)	109
Involved in Outside Activities	41 (.41)	31 (.38)	72
Total	100	81	181

Note: Total is lower at T_3 reflecting cadets who left the Academy between T_3 and T_2.

T_1: χ^2 (1) = .59, p = .442.
T_2: χ^2 (1) = .79, p = .374.
T_3: χ^2 (1) = .14, p = .709.

Appendix H
Squadron Social Network Stability and Continuity

Table H.1 Stability of Peer Groups over the Academic Year with Dyads Removed.

	Percent Stable		
	T_1 to T_2	T_1 to T_3	T_2 to T_3
Squadron A			
Identical	43% (6/14)	21% (3/14)	29% (6/21)
Modified	36% (5/14)	50% (7/14)	43% (9/21)
Total Stable Groups	79% (11/14)	71% (10/14)	71% (15/21)
Fragmented	0% (0/14)	7% (1/14)	10% (2/21)
Dissolved	21% (3/14)	21% (3/14)	19% (4/21)
Total Unstable Groups	21% (3/14)	29% (4/14)	29% (6/21)
Squadron H			
Identical	15% (2/13)	31% (4/13)	57% (8/14)
Modified	54% (7/13)	46% (6/13)	36% (5/14)
Total Stable Groups	69% (9/13)	77% (10/13)	93% (13/14)
Fragmented	23% (3/13)	15% (2/13)	0% (0/14)
Dissolved	8% (1/13)	8% (1/13)	7% (1/14)
Total Unstable Groups	31% (4/13)	23% (3/13)	7% (1/14)

Notes: Totals not summing to 100% are due to rounding.

Table H.2: Stability of Peer Groups over the Academic Year with all Groups Included (Dyads Included).

	Percent Stable		
	T_1 to T_2	T_1 to T_3	T_2 to T_3
Squadron A			
Identical	56% (13/23)	41% (9/22)	38% (10/26)
Modified	22% (5/23)	32% (7/22)	35% (9/26)
Total Stable Groups	78% (19/23)	73% (16/22)	73% (19/26)
Fragmented	0% (0/23)	5% (1/22)	8% (2/26)
Dissolved	22% (4/23)	23% (5/22)	17% (5/26)
Total Unstable Groups	22% (4/23)	27% (6/22)	27% (7/26)
Squadron H			
Identical	27% (4/15)	40% (6/15)	61% (11/18)
Modified	47% (7/15)	40% (6/15)	28% (5/18)
Total Stable Groups	73% (11/15)	80% (12/15)	89% (16/18)
Fragmented	20% (3/15)	13% (2/15)	0% (0/18)
Dissolved	7% (1/15)	7% (1/15)	11% (2/18)
Total Unstable Groups	27% (4/15)	20% (3/15)	11% (2/18)

Notes: Totals not summing to 100% are due to rounding.

H.3: Continuity of Overall Network Status in the Squadron Social Network T_1 to T_2.

	November 97 (T_2) Network Status				
August 97 (T_1) Network Status	Nuclear	Secondary	Peripheral	Marginal	Isolate
Squadron A					
Nuclear	2/5	2/5	1/5	0	0
Secondary	3/40	26/40	8/40	2/40	1/40
Peripheral	0	14/22	5/22	3/22	0
Marginal	0	5/25	10/25	3/25	7/25
Isolate	0	3/18	1/18	8/18	6/18
Squadron H					
Nuclear	7/18	14/18	3/18	1/18	0
Secondary	3/26	12/26	5/26	1/26	5/26
Peripheral	1/15	6/15	2/15	5/15	1/15
Marginal	0	7/24	4/24	7/24	6/24
Isolate	0	2/16	1/16	7/16	6/16

H.4: Continuity of Overall Network Status in the Squadron Social Network from T_1 to T_3.

	April 98 (T_3) Network Status				
August 97 (T_1) Network Status	Nuclear	Secondary	Peripheral	Marginal	Isolate
Squadron A					
Nuclear	2/5	0	2/5	0	1/5
Secondary	0	18/37	15/37	1/37	3/37
Peripheral	2/22	10/22	4/22	4/22	2/22
Marginal	0	6/25	3/25	7/25	9/25
Isolate	0	2/18	2/18	2/18	12/18
Squadron H					
Nuclear	6/18	9/18	3/18	0	0
Secondary	7/25	9/25	4/25	5/25	0
Peripheral	1/15	6/15	5/15	2/15	1/15
Marginal	2/23	5/23	8/23	5/23	2/23
Isolate	1/16	3/16	5/16	5/16	2/16

H.5: Continuity of Overall Network Status in the Squadron Social Network from T_2 to T_3.

	April 98 (T_3) Network Status				
November 97 (T_2) Network Status	Nuclear	Secondary	Peripheral	Marginal	Isolate
Squadron A					
Nuclear	2/4	2/4	0	0	0
Secondary	1/48	23/48	15/48	4/48	5/48
Peripheral	0	7/25	9/25	7/25	2/25
Marginal	1/16	2/16	1/16	2/16	10/16
Isolate	0	2/14	1/14	2/14	9/14
Squadron H					
Nuclear	7/11	3/11	1/11	0	0
Secondary	9/34	14/34	8/34	3/34	0
Peripheral	2/15	8/15	2/15	3/15	0
Marginal	0	5/21	8/21	6/21	2/21
Isolate	0	2/16	6/16	5/16	3/16

Appendix I
Differences between Informal and Formal Leaders

Table I.1: Phi Correlations of Formal and Informal Leadership for Juniors and Seniors at all Three Time Points.

	1	2	3	4	5	6	7	8	9
1. Self-Report of Formal Leader Time 1	1.00 (54)								
2. Self-Report of Formal Leader Time 2	.69*** (37)	1.00 (56)							
3. Self-Report of Formal Leader Time 3	.42* (32)	.56** (35)	1.00 (57)						
4. Official Record of Formal Leader Time 1	.52*** (50)	.44*** (54)	-.02 (55)	1.00 (87)					
5. Official Record of Formal Leader Time 2	.46** (52)	.45** (55)	.00 (56)	1.00*** (87)	1.00 (89)				
6. Official Record of Formal Leader Time 3	.32* (52)	.23+ (55)	.68*** (56)	-.08 (87)	-.08 (89)	1.00 (89)			
7. Informal Leadership Time 1	.37** (54)	.32* (56)	.18 (57)	.09 (87)	.09 (89)	.16 (89)	1.00 (105)		
8. Informal Leadership Time 2	.39** (54)	.49*** (56)	.16 (57)	.26* (87)	.25* (87)	-.02 (89)	.41*** (105)	1.00 (105)	
9. Informal Leadership Time 3	.27* (54)	.16 (56)	.12 (57)	.15 (87)	.14 (89)	.19+ (89)	.38*** (105)	.49*** (105)	1.00 (105)

Note: N for each correlation in parenthesis.

Table I.2: Differences for Informal Leadership Status for Juniors and Seniors in Both Squadrons for Number of Peer Nominations at Time Points Two and Three.

	Informal Leader	Not informal Leader	Total
T_2 Most Respected in Squadron			
One or More Nominations	41 (.73)	11 (.33)	52
No Nominations	15 (.27)	22 (.67)	37
Total	56	33	89
T_3 Most Respected in Squadron			
One or More Nominations	37 (.79)	8 (.19)	45
No Nominations	10 (.21)	34 (.81)	44
Total	47	42	89
T_2 Best Exemplifies Core Values			
One or More Nominations	38 (.68)	11 (.33)	49
No Nominations	18 (.32)	22 (.67)	40
Total	56	33	89
T_3 Best Exemplifies Core Values			
One or More Nominations	39 (.83)	9 (.21)	48
No Nominations	8 (.17)	33 (.71)	41
Total	47	42	89
T_2 Best Leader After Graduation			
One or More Nominations	47 (.84)	10 (.30)	57
No Nominations	9 (.16)	23 (.70)	32
Total	56	33	89
T_3 Best Leader After Graduation			
One or More Nominations	40 (.85)	8 (.19)	48
No Nominations	7 (.15)	34 (.81)	41
Total	47	42	89

Respect, T_2: χ^2 (1) = 13.60, $p < .001$ Respect, T_3: χ^2 (1) = 31.60, $p < .001$
Core Value, T_2: χ^2 (1) = 10.00, $p = .002$ Core Value, T_3: χ^2 (1) = 33.82, $p < .001$
Grad. Leader, T_2: χ^2 (1) = 25.93, $p < .001$ Grad. Leader, T_3: χ^2 (1) = 38.96, $p < .001$

Table I.3: Summary of the Differences Between Informal Leaders at Time Points Two and Three.

	Informal Leader		Not informal Leader			
	Mean (sd)	n	Mean (sd)	n	T	p
Time 2 - November 1997						
Current MPA	2.95 (.52)	56	2.64 (.39)	33	2.96	.004
Current GPA	2.99 (.46)	56	2.95 (.43)	33	0.43	.669
ICS Academic Scale	4.36 (1.58)	40	4.65 (1.28)	20	0.71	.483
ICS Leadership Scale	5.24 (.97)	40	4.71 (1.19)	20	1.86	.068
ICS Aggression Scale	5.38 (1.08)	40	5.33 (1.34)	20	0.18	.861
Self Report - ICS Leadership Item	5.57 (1.14)	37	5.06 (1.16)	18	1.55	.127
Time 3 - April 1998						
Current MPA	3.00 (.47)	47	2.65 (.37)	42	3.87	< .001
Current GPA	3.13 (.45)	47	2.86 (.47)	42	2.74	.007
ICS Academic Scale	4.58 (1.55)	32	4.32 (1.41)	28	0.67	.507
ICS Leadership Scale	5.35 (.97)	32	4.73 (1.09)	28	2.32	.024
ICS Aggression Scale	5.43 (1.16)	32	5.30 (1.18)	28	0.43	.667
Self Report - ICS Leadership Item	5.57 (1.12)	35	4.81 (1.40)	21	2.24	.029

Notes: All averages are in the raw metric. The scale for performance averages (MPA, GPA, PEA) ranges from 0 (low) to 4 (high). For the ICS leadership and academic scales, the range is 1 (low) to 7 (high). For the ICS aggression scale, the range is 7 (low) to 1 (high).